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LAPORAN Pengerusi

CHAIRMAN'S REPORT

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

Saya ingin mengambil kesempatan ini untuk mengucapkan setinggi-tinggi terima kasih kepada Y.B. Dato' Seri Azmi Khalid, Menteri Sumber Asli dan Alam Sekitar (NRE) Malaysia yang telah melantik saya selaku Pengerusi MFRDB bagi tempoh dua tahun, berkuat kuasa 1 Jun 2006. Saya teruja untuk bekerja sama dengan kesemua ahli lembaga. Tiada sebarang pertukaran dalam keahlian lembaga pada tahun 2006, kecuali ahli lembaga baru kita yang mewakili Persatuan Industri Kayu-Kayan Malaysia.

Selaku Pengerusi MFRDB serta Ketua Setiausaha NRE, saya sangat gembira dengan pencapaian FRIM pada 2006, yang turut memberi sumbangan yang signifikan kepada Kementerian. FRIM diiktiraf dan dihormati oleh institusi penyelidikan yang berkaitan di seluruh dunia. Para saintis FRIM telah berjaya merangkul pelbagai anugerah kehormatan dan juga saintifik baik di peringkat kebangsaan, mahupun di peringkat antarabangsa. Ini merupakan satu pencapaian yang terpuji.

Saya menghargai prestasi FRIM yang begitu menonjol dalam bidang penyelidikan perhutanan dan hasil bukan hutan, yang terus menjadi teras utama aktiviti institut ini. Bagaimanapun, dari segi pengkomersialan hasil dan penemuan R&D, masih ada ruang untuk penambahbaikan. Apabila hendak menjalankan sesuatu projek, usaha perlulah diambil untuk memasukkan rakan kongsi daripada pihak industri. Usaha ini adalah untuk menyediakan pemindahan teknologi oleh pihak industri. Kerjasama yang lebih rapat dengan pihak industri perlulah diwujudkan.

R&D FRIM seharusnya terus mencari kemungkinan untuk memaksimumkan penggunaan spesies kayu. Pendekatan seumpama ini akan dapat mengurangkan tekanan pembalakan secara berleluasa di hutan semula jadi kita. Kayu, yang boleh digunakan untuk menghasilkan produk yang mempunyai nilai tambah tidak sepatutnya ditinggalkan di dalam hutan sebagai bahan buangan. Meminimumkan bahan buangan sepatutnya menjadi amalan semua dalam penggunaan kayu-kayan.

Di samping menumpukan pada penggunaan kayu-kayan, kepentingan hasil hutan bukan-kayu juga tidak boleh di pandang ringan. Dalam konteks ini, peluang terbuka luas untuk kita memanfaatkan ekosistem sebagai destinasi untuk eko-pelancongan dan juga untuk aktiviti menghargai alam semula jadi. FRIM bersama-sama Jabatan Perhutanan Semenanjung Malaysia dapat memainkan peranan dalam meningkatkan sektor pelancongan negara dengan



I would like to take this opportunity to thank Y.B. Dato' Seri Azmi Khalid, the Honorable Minister of Natural Resources and Environment (NRE) Malaysia for appointing me as the Chairman of MFRDB for a term of two years, effective 1 June 2006. I look forward to working with all the board members. There was no change in the membership of the board in 2006 with the exception of our new member representing the Malaysian Wood Industries Association.

As Chairman of the MFRDB and Secretary General of NRE, I am happy with the achievements of FRIM in 2006, which have contributed significantly to the Ministry. FRIM is recognised and respected by other related research institutions throughout the world. FRIM scientists have won honorary and scientific awards at the national and international levels. These achievements are commendable.

I acknowledge FRIM's outstanding performance from the standpoint of forestry and forest product research, which remains the core business of the institute. Nevertheless, in terms of commercialisation of R&D findings and outputs, there is always room for improvement. When initiating R&D projects, efforts should be made to include industrial partners. Such arrangements would facilitate immediate technology uptake by the industries. Closer collaboration with the industries is needed.



menyediakan latihan kepada pemandu pelancong alam semula jadi. Apa yang perlu dilakukan adalah dengan meningkatkan lagi usaha dan program yang sedia ada, seperti memperkemas pakej maklumat serta bekerjasama dengan pengusaha pelancongan. Secara ringkasnya, kita perlulah melihat hutan bukan semata-mata sebagai sumber kayu-kayuan malah juga menyediakan pelbagai perkhidmatan yang lain.

Bioteknologi dalam bidang perhutanan kian pesat membangun sebagai salah satu bidang sains yang menyediakan banyak peluang bagi penemuan saintifik. Ia juga merupakan bidang pelaburan yang baru serta sumber kekayaan bagi pertumbuhan negara pada masa hadapan. Sehubungan dengan itu, FRIM sepatutnya mengambil daya inisiatif untuk membangunkan produk dan proses yang berasaskan bioteknologi. Dalam hal ini, FRIM sangat beruntung kerana mempunyai bukan sahaja sumber manusia dan keupayaan malahan juga kemudahan-kemudahan dan infrastruktur yang moden. Bagaimanapun, kepentingan ilmu pengetahuan tradisi tidak sepatutnya diabaikan.

Saya berbangga bahawa FRIM kini sedang memulakan beberapa projek yang berkaitan dengan kepentingan negara, termasuklah Muzeum Sejarah Alam Semula Jadi dan Inventori Biodiversiti Negara. Usaha-usaha seumpama ini akan dapat menonjolkan kewibawaan FRIM dalam melaksanakan projek-projek yang penting serta menjalankan penyelidikan yang berimpak.

Seharusnya FRIM meneruskan usaha-usaha yang baik bukan sahaja sebagai sebuah institusi penyelidikan malah sebagai penyedia perkhidmatan. Sistem penyampaian yang berkesan dalam memberikan perkhidmatan kepada pelanggan serta sistem pembayaran perkhidmatan yang menepati masa merupakan antara perkara yang perlu diberi perhatian segera.

Akhir kata, kita mestilah menyediakan perkhidmatan yang terbaik atau menjalankan tugas dengan cara yang terbaik. MFRDB di bawah kepimpinan saya selaku Pengerusinya akan terus memantau serta menyokong segala aktiviti dan usaha yang dijalankan oleh FRIM. Semangat bekerja sama akan dapat menghasilkan prestasi kerja yang lebih baik.

FRIM's R&D should continually look into the possibility of maximising the use of timber species. Such an approach would relieve the pressures of excessive harvesting of our natural forests. Wood, which can be used to produce value-added products should not left in the forest as waste. Minimising wastage should be the axiom for utilisation of timber.

Besides focusing on utilising timber, the importance of non-timber forest products should not be overlooked. In the context, there are ample opportunities to use forest ecosystems as destinations for eco-tourism and nature interpretation. Both FRIM and the Forestry Department Peninsular Malaysia can play a role in enhancing the country's tourism sector by providing training to nature tourist guides. What is needed is to add value to current efforts, such as packaging of information and working together with tour operators, to enhance existing programmes. In short, one should view the natural forests not only as a source of timber alone, but also as a provider of other services.

Biotechnology in forestry is a rapidly advancing field of science, which provides many opportunities for scientific discoveries. It is also viewed as a new area of investment and a source of wealth for future growth. It is important that FRIM takes the initiative to develop products and processes based on biotechnology. FRIM is fortunate to have not only the manpower and capacity but also the modern facilities and infrastructures to do so. In this endeavour, the importance of traditional knowledge cannot be ignored.

I am proud that FRIM is embarking on a number of projects, which are of national interest. They include the Natural History Museum and the National Inventory of Biodiversity. Such efforts would demonstrate FRIM's capability in implementing projects of significance and in conducting research with impact.

FRIM should continue with the good work not only as a research institution but also as a service provider. A sound delivery system of extending appropriate services to clients and timely payment of services rendered are matters that warrant immediate attention.

Finally, we must provide the best service or perform the best job. Under my chairmanship, the MFRDB will continue to monitor and support FRIM's activities and efforts. The spirit of working together will uplift us to a higher level of performance.

DATO' SUBOH MOHD. YASSIN

DPSJ, KMN

Pengerusi MFRDB

Chairman of MFRDB

**LEMBAGA PENYELIDIKAN DAN
PEMBANGUNAN PERHUTANAN MALAYSIA**



***MALAYSIAN FORESTRY RESEARCH AND
DEVELOPMENT BOARD***



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DPSJ, KMN

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Ministry of Natural Resources and Environment Malaysia

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PN. RAHANA MD. NOH (Silih Ganti)
Kementerian Kewangan Malaysia
Ministry of Finance Malaysia

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Y. BHG. DATO' DAHLAN TAHA

DPSK, BSK (Silih Ganti)
Jabatan Perhutanan Semenanjung Malaysia
Forestry Department of Peninsular Malaysia

Y. BHG. DATO' MOHD. NAZURI HASHIM SHAH

DSNS, JSM, DSM, AMN, BSK, PMC

CIK KHONG LYE FONG (Silih Ganti)

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Malaysian Timber Industry Board (MTIB)

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EN. CHOONG KIAN KEE (Silih Ganti)

Persatuan Pekilang Panel Malaysia
Malaysian Panel-Products Manufacturer's Association (MPMA)

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Association of Malaysian Bumiputra Timber and Furniture Entrepreneurs

EN. AHMAD LOMAN

Kementerian Perusahaan Perladangan dan Komoditi (KPPK)
Ministry of Plantation Industries and Commodities

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Lembaga Getah Malaysia
Malaysian Rubber Board

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Universiti Kebangsaan Malaysia
National University of Malaysia

Y. BHG. DATO' DR. JAMES DAWOS MAMIT

Penasihat Alam Sekitar Kerajaan Negeri Sarawak
Environment Advisor to the Sarawak State Government

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DR. LEE YING FAH (Silih Ganti)
Jabatan Hutan Sabah
Sabah Forest Department

Y. BHG. DATU CHEONG EK CHOON

DJBS, PBK, PPB

EN. LAI KHIM KUET (Silih Ganti)

Jabatan Hutan Sarawak
Sarawak Forest Department

EN. NIK MOHD. SHAH NIK MUSTAFA

EN. SAMSU ANUAR NAWI (Silih Ganti)
Jabatan Perhutanan Negeri Selangor
Selangor Forestry Department

EN. NG KAY YIP

EN. PON CHIA HWEE (Silih Ganti)
Persatuan Industri Kayu-Kayan Malaysia
Malaysian Wood Industries Association (MWIA)

Y. BHG. DATO' DR. ABDUL RAZAK MOHD. ALI

DIMP, JMN, FMIC
Institut Penyelidikan Perhutanan Malaysia
Forest Research Institute Malaysia



Dari kiri *From left*

En. Ahmad Loman, Dr. Lee Ying Fah (Silih Ganti), En. Ng Kay Yip, Y. Bhg. Dato' Mohd. Nazuri Hashim Shah, En. Nik Mohd. Shah Nik Mustafa, Pn. Azyiah Mohamed, Y. Bhg. Dato' Dr. Abdul Razak Mohd. Ali, Y. Bhg. Dato' Suboh Mohd. Yassin (Pengerusi), Y. Bhg. Dato' Dr. James Dawos Mamit, Pn. Rahana Md. Noh, Dr. Raymond Chan Heun Yin, Tuan Hj. Rabuan Sulaiman, Y. Bhg. Dato' Dahlan Taha (Silih Ganti)

Tiada di dalam gambar *Not in photo*

Y. Bhg. Dato' Seri Azahar Muda, Pn. Ong Joo Lin, Y. Bhg. Dato' Sheikh Othman Sheikh Abdul Rahman, Y. Bhg. Dato' Prof. Dr. Abdul Latiff Mohamed, Y. Bhg. Datu Cheong Ek Choon, Y. Bhg. Datuk Sam Mannan

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PN. RAHANA MD. NOH (Silih Ganti)
Kementerian Kewangan Malaysia
Ministry of Finance Malaysia

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Y. BHG. DATO' DAHLAN TAHA
DPSK, BSK (Silih Ganti)
Jabatan Perhutanan Semenanjung Malaysia
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Lembaga Getah Malaysia
Malaysian Rubber Board

TUAN HJ. RABUAN SULAIMAN
EN. ZAINI ITHNIN HJ. A. RAZAK (Silih Ganti)
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DIMP, JMN, FMIC
Institut Penyelidikan Perhutanan Malaysia
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CIK KHONG LYE FONG (Silih Ganti)

Lembaga Perindustrian Kayu Malaysia

Malaysian Timber Industry Board (MTIB)

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DIMP, JP

EN. M. CHANDRA SEKARAN (Silih Ganti)

Persatuan Pekilang Panel Malaysia

Malaysian Panel-Products Manufacturer's Association (MPMA)



INSTITUT PENYELIDIKAN PERHUTANAN MALAYSIA



**FOREST RESEARCH
INSTITUTE MALAYSIA**



LAPORAN KETUA PENGARAH

DIRECTOR GENERAL'S REPORT



The year 2006 represented my eleventh year in office as the Director General of FRIM. Much had been achieved during the year in terms of awards and appointments, human resource development, research and development, publications, infrastructural development, and technology transfer.

During the year, several FRIM officers were conferred honorary awards. Dr. Rahim Sudin was conferred two honorary awards, namely, Darjah Seri Melaka (DSM) and Bintang Ahli Mangku Negara (AMN). Dr. Nur Supardi Md. Noor received Ahli Mahkota Kedah (AMK). Puan Habibah Mohamad was conferred Pingat Pangkuan Negara (PPN).

FRIM officers continued to win scientific awards in 2006. Puan Nor Hasnida Hasan was awarded the Young Scientist Award Selangor 2006. In the Fifth Invention Competition of Malaysian Technology Expo, FRIM scientists won one gold award and five silver awards. In the Seventeenth International Invention Innovation Industrial Design & Technology Exhibition 2006 (ITEX 2006), FRIM won three gold and three silver medals. Bronze medals were won during the International Bio-Technology Asia Conference and Exhibition 2006, the Research, Invention and Innovation Exposition held at Universiti Malaya.

FRIM is proud that several research officers gained recognition through international and national appointments. Dato' Dr. Wan Razali Wan Mohd. (Deputy Director General for R&D) was elected President of the Institute of Foresters Malaysia for the period 2006-2007. He was featured as one of the distinguished alumni members in the book entitled, "75 Jewels of UPM" which was published in conjunction with the 75th Anniversary of UPM. Dr. Lee, S.S. and Dr. Chan, H.T. were appointed Associate Editor of Mycoscience, and Editorial Board Member of Ecological Research, international journals produced by the Mycological Society of Japan and by the Ecological Society of Japan, respectively. Both these journals are published by Springer-Verlag, Tokyo, Japan. Dr. Saw, L.G. was appointed Member of the Science Audit to the Royal Botanic Gardens (RBG), Kew, UK. Dr. Nur Supardi Md. Noor and Dr. Ismariah Ahmad were appointed editors of Malaysian Forester, a journal produced by the Forestry Department of Peninsular Malaysia.

Tahun 2006 merupakan tahun kesebelas saya selaku Ketua Pengarah FRIM. Banyak kejayaan yang memberangsangkan telah dicapai di sepanjang tahun ini dari segi penerimaan anugerah serta pelantikan, pembangunan sumber manusia, penyelidikan, penerbitan, pembangunan infrastruktur dan pemindahan teknologi.

Beberapa orang pegawai FRIM telah menerima anugerah bintang kebesaran. Dr. Rahim Sudin menerima dua bintang kebesaran iaitu Darjah Seri Melaka (DSM) dan Ahli Mangku Negara (AMN). Dr. Nur Supardi Md. Noor menerima Ahli Mahkota Kedah (AMK) manakala Puan Habibah Mohamad menerima Pingat Pangkuan Negara (PPN).

Pegawai-pegawai FRIM juga terus menerima anugerah-anugerah saintifik pada tahun 2006. Puan Nor Hasnida Hasan dianugerahi Anugerah Saintis Muda Selangor 2006. Dalam pertandingan Reka Cipta Ekspo Teknologi Malaysia yang ke-5, saintis FRIM telah memenangi satu pingat emas dan lima pingat perak. Pada Pameran Reka Cipta dan Inovasi Reka Bentuk Industri dan Teknologi Antarabangsa 2006 yang ke-17 (ITEX 2006), FRIM telah memenangi tiga pingat emas dan tiga pingat perak. Sementara itu, pingat gangsa pula telah dimenangi oleh saintis FRIM pada Pameran dan Persidangan Antarabangsa

Bioteknologi Asia 2006, Ekspo Penyelidikan, Reka Cipta dan Inovasi yang diadakan di Universiti Malaya.

FRIM juga turut berbangga dengan beberapa pengiktirafan yang diterima oleh pegawai-pegawai penyelidik melalui pelantikan di peringkat kebangsaan dan juga antarabangsa. Dato' Dr. Wan Razali Wan Mohd. (Timbalan Ketua Pengarah, Penyelidikan) telah dipilih sebagai Presiden Institut Rimbawan Malaysia bagi tempoh 2006-2007. Beliau juga telah dipilih untuk muncul sebagai salah seorang ahli kehormat alumni UPM dalam buku yang bertajuk "75 Permata UPM" yang diterbitkan sempena Ulang Tahun UPM yang ke-75. Dr. Lee, S.S. dan Dr. Chan, H.T. telah dilantik sebagai editor bersekutu *Mycoscience*, dan ahli lembaga editor *Ecological Research*, masing-masing merupakan jurnal antarabangsa yang dihasilkan oleh Persatuan Mikologi Jepun dan Persatuan Ekologi Jepun. Kedua-dua jurnal diterbitkan oleh Springer-Verlag, Tokyo, Jepun. Dr. Saw, L.G. dilantik sebagai ahli Audit Sains Royal Botanic Gardens (RBG), Kew, UK. Dr. Nur Supardi Md. Noor dan Dr. Ismariah Ahmad pula dilantik antara editor *Malaysian Forester*, jurnal yang diterbitkan oleh Jabatan Perhutanan Semenanjung Malaysia.

Tujuh orang pegawai FRIM berjaya menamatkan pengajian di peringkat doktor falsafah pada 2006. Mereka terdiri daripada Dr. Nik Musaadah Nik Mustapha (King's college), Dr. Fadhilah Zainuddin (Birmingham), Dr. Nurhanan Murni Yunos (Sydney), Dr. Wan Asma Ibrahim (UPM), Dr. Christine Dawn Fletcher (UKM), Dr. Getha Krishnasamy (UM) dan Dr. Chang Li Yen (UM). Sembilan orang pegawai pula berjaya menamatkan pengajian di peringkat sarjana iaitu Pn. Wan Rahmah Wan Raof (UPM), Pn. Mastura Buang (UIA), En. Nazarudin Mohd. Roseli (UPM), Pn. Sharmiza Adnan (UKM), Cik Chan Yoke Mui (UM), Pn. Nor Ezzawanis (USM), Pn. Anee Suryani Sued (UKM), Pn. Rafedah Abas (USM) dan Pn. Nor Datiakma Mat Amin (UIAM).

Satu lagi pencapaian yang membanggakan ialah *Journal of Tropical Forest Science (JTFS)*, jurnal antarabangsa yang diterbitkan oleh FRIM membawa faktor impak 0.113 (ISI Journal Citation Report 2005), satu-satunya jurnal di Malaysia yang mempunyai Faktor Impak. JTFS kini diindeks oleh dua pangkalan data antarabangsa, iaitu *Current Contents Connect of ISI Web of Knowledge* dan *Scopus of Elsevier*. Di samping meneruskan usaha menerbitkan penemuan penyelidikan mereka di dalam JTFS, saya gembira bahawa semakin ramai saintis FRIM mula turut menerbitkannya di dalam jurnal dan buku antarabangsa.

Pembinaan kompleks baru Pusat Biodiversiti Hutan Tropika (TFBC) FRIM telah bermula pada Oktober 2006 dan dijangka akan disiapkan pada Disember 2007. Terletak di Jalan Jelutong, FRIM, kompleks TFBC ini terdiri daripada Blok A dan B

Seven FRIM officers completed their Ph.D during the year. They were Dr. Nik Musaadah Nik Mustapha (King's college), Dr. Fadhilah Zainuddin (Birmingham), Dr. Nurhanan Murni Yunos (Sydney), Dr. Wan Asma Ibrahim (UPM), Dr. Christine Dawn Fletcher (UKM), Dr. Getha Krishnasamy (UM) and Dr. Chang Li Yen (UM). Another nine officers completed their M.Sc. They were Pn. Wan Rahmah Wan Raof (UPM), Pn. Mastura Buang (UIA), En. Nazarudin Mohd. Roseli (UPM), Pn. Sharmiza Adnan (UKM), Cik Chan Yoke Mui (UM), Pn. Nor Ezzawanis (USM), Pn. Anee Suryani Sued (UKM), Pn. Rafedah Abas (USM) and Pn. Nor Datiakma Mat Amin (UIAM).

Another noteworthy achievement is that FRIM's Journal of Tropical Forest Science (JTFS) carries an Impact Factor of 0.113 (ISI Journal Citation Report, 2005). It is the only Malaysian journal with an Impact Factor. JTFS is now indexed by two international databases, namely, Current Contents Connect of ISI Web of Knowledge and Scopus of Elsevier. While continuing to publish in JTFS, I am glad to note that more FRIM scientists have started publishing their research findings in international journals and books.

Construction of the new complex of FRIM Tropical Forest Biodiversity Centre (TFBC) started in October 2006 and is expected to be completed by December 2007. Located at the Jelutong Avenue in FRIM, the complex comprises Blocks A and B which are interconnected by a corridor. With a total floor space of about 3,600 m², the complex will house the research units of botany, zoology, pathology and conservation. The Kepong Herbarium, which serves as the National Herbarium of Malaysia, will be located in Block B. The herbarium in FRIM has a collection of more than 300,000 specimens and is currently the third largest in Southeast Asia.

Much effort was made to develop the entrance to the Kepong Botanic Gardens. A tarmac car park had been constructed and landscaping with a variety of fan-leaved palms to provide good visual impact on visitors as they first come into the gardens is well underway. Work on the paved 400 m long understorey plant trail had started. Along the trail, a variety of palms including rattans, aroids and gingers were planted to enrich the existing understorey flora. The trail named as Razak Trail will be launched in 2007, honouring my official retirement as Director General of FRIM.

Five laboratories received ISO 9001:2000 accreditation during the year. They were the Wood Analytical, Furniture Testing, Wood Lamination, Wood Finishing and Wood Anatomy Laboratories.

yang saling bersambung melalui koridor. Dengan ruang lantai berkeluasan 3600 m², kompleks ini akan menempatkan unit-unit penyelidikan botani, zoologi, patologi dan pemuliharaan. Herbarium Kepong, yang merupakan Herbarium Negara Malaysia akan ditempatkan di Blok B. Herbarium di FRIM mempunyai koleksi lebih daripada 300 000 spesimen dan pada masa ini merupakan herbarium yang ketiga terbesar di Asia Tenggara.

Usaha-usaha juga telah dijalankan untuk membangunkan pintu masuk utama ke Taman-Taman Botani Kepong. Tempat letak kereta bertar telah dibina. Manakala kerja-kerja melandskap dengan penanaman pelbagai jenis pokok palma berdaun bentuk kipas bagi mewujudkan pemandangan yang menarik kepada pengunjung sedang giat dijalankan. Di samping itu, kerja-kerja penyediaan denai sepanjang 400 m juga sudah bermula. Di sepanjang denai, pelbagai jenis palma termasuklah rotan, keladi dan halia telah ditanam bagi mempelbagaikan flora yang sedia ada. Denai yang dinamakan Denai Razak ini mengambil sempena nama Ketua Pengarah FRIM sekarang yang akan bersara. Denai ini akan dirasmikan pada 2007.

Lima buah makmal di FRIM iaitu Makmal Analisis Kayu, Makmal Ujian Perabot, Makmal Laminasi Kayu, Makmal Kemasiapan Kayu dan Makmal Anatomi Kayu telah mendapat akreditasi ISO 9001-2000 pada tahun ini. Manakala Makmal Biji Benih dan Makmal Genetik berjaya mengekalkan status ISO 9001 masing-masing. Tujuh perjanjian persefahaman dengan pelbagai institusi penyelidikan dan agensi kerajaan di peringkat kebangsaan dan antarabangsa telah ditandatangani. Antaranya ialah Forestry and Forest Products Research Institute, Tsukuba, Jepun; Royal Botanic Gardens, Kew, UK; PT Mutu Agung Lestari, Bogor, Indonesia; Kolej Universiti Kejuruteraan Utara Malaysia (KUKUM); Cooperation Internationale en Recherche Agronomique pour le Development (CIRAD), Paris, France; Kementerian Pembangunan Usahawan dan Koperasi; dan Majlis Perbandaran Taiping.

Meskipun FRIM telah mencapai pelbagai kejayaan pada tahun ini, masih banyak lagi yang perlu dibuat penambahbaikan ke arah meningkatkan prestasi institut ini di peringkat kebangsaan dan antarabangsa. Kita perlu mengubah cara kita menjalankan sesuatu tugas dan tidak sekadar bekerja untuk menyelesaikan tugas tersebut. Kita perlulah menjalankan tugas secara bermaruah dan berdedikasi agar kita akan berjaya dalam setiap pekerjaan yang kita lakukan. Sehubungan dengan itu, kita perlulah mengubah cara kita bekerja dan memasarkan diri kita. Berdasarkan pada tahun 2006, mesej yang ingin saya sampaikan ialah "berubahlah ke arah kebaikan demi mencapai kecemerlangan yang lebih jitu."

The Seed Technology and Genetics Laboratories successfully retained their ISO 9001 status. Seven MOUs were signed with various national and international research institutes and government agencies. They included Forestry and Forest Products Research Institute, Tsukuba, Japan; Royal Botanic Gardens, Kew, UK; PT Mutu Agung Lestari, Bogor, Indonesia; Kolej Universiti Kejuruteraan Utara Malaysia (KUKUM); Cooperation Internationale en Recherche Agronomique pour le Development (CIRAD), Paris, France; Kementerian Pembangunan Usahawan dan Koperasi; and Majlis Perbandaran Taiping.

Although FRIM had made significant achievements during the year, a lot more needs to be done to further improve the institute's performance at the national and international levels. We have to change the way we do things and not just going through the motion of getting jobs done. We need to take pride and be dedicated so that we are champions in what we do. My concern is that, many things FRIM has achieved, are not known to the general public. Therefore, we must change the way we do things and the way we market ourselves. Based on the year 2006, my message is, "change for the better to further excel."



DATO' DR. ABDUL RAZAK MOHD. ALI

DIMP, JMN, FMIC
Ketua Pengarah FRIM
Director General FRIM

AHLI DIREKTORAT

DIRECTORATE MEMBERS

Pengerusi Chairman

Y. BHG. DATO' DR. ABDUL RAZAK MOHD. ALI
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)

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

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Senior Director Administration and Multimedia Division

DR. ABDUL RAHIM NIK, AMN
Pengarah Kanan Bahagian Perhutanan dan Pemuliharaan
Senior Director Forestry and Conservation Division

DR. HOI WHY KONG, AMN
Pengarah Kanan Bahagian Pembangunan Produk
Senior Director Product Development Division

DR. BASKARAN KRISHNAPILLAY
Pengarah Kanan Bahagian Bioteknologi
Senior Director Biotechnology Division

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

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

DR. CHAN HUNG TUCK, KMN
Pengarah Kanan Bahagian Pengurusan Penyelidikan
Senior Director Research Management Division

DR. SAW LENG GUAN
Pengarah Program TFBC
Director TFBC Programme

DR. SHAMSUDIN IBRAHIM
Pengarah Kanan Program Pengurusan dan Ekologi Hutan
Senior Director Forest Management and Ecology Programme

DR. NOOR AZLIN YAHYA
Pengarah Program Hutan Bandar dan Rekreasi
Director of Urban Forestry and Recreation Programme

DR. MOHD. NOR MOHD. YUSOFF
Pengarah Kanan Program Kimia Kayu
Senior Director Wood Chemistry Programme



DR. RAHIM SUDIN

Pengarah Program Pembinaan dan Perlindungan Kayu
Director Timber Construction and Protection Programme

DR. TAN YU ENG

Pengarah Program Pemprosesan dan Teknologi Kayu
Director Timber Processing and Technology Programme

DR. ABD. RASIP ABD. GHANI

Pengarah Program Hutan Ladang
Director Forest Plantations Programme

DR. RASADAH MAT ALI

Pengarah Program Tumbuhan Ubatan
Director Medicinal Plants Programme

DR. MARZALINA MANSOR

Pengarah Program Bioteknologi Hutan
Director Forest Biotechnology Programme

DR. WOON WENG CHUEN LIMIS

Pengarah Program Tekno-Ekonomi
Director Techno-Economics Programme

DR. NORINI HARON

Ketua Unit Hal Ehwal Antarabangsa dan Undang-Undang
Head of International and Legal Affairs Unit

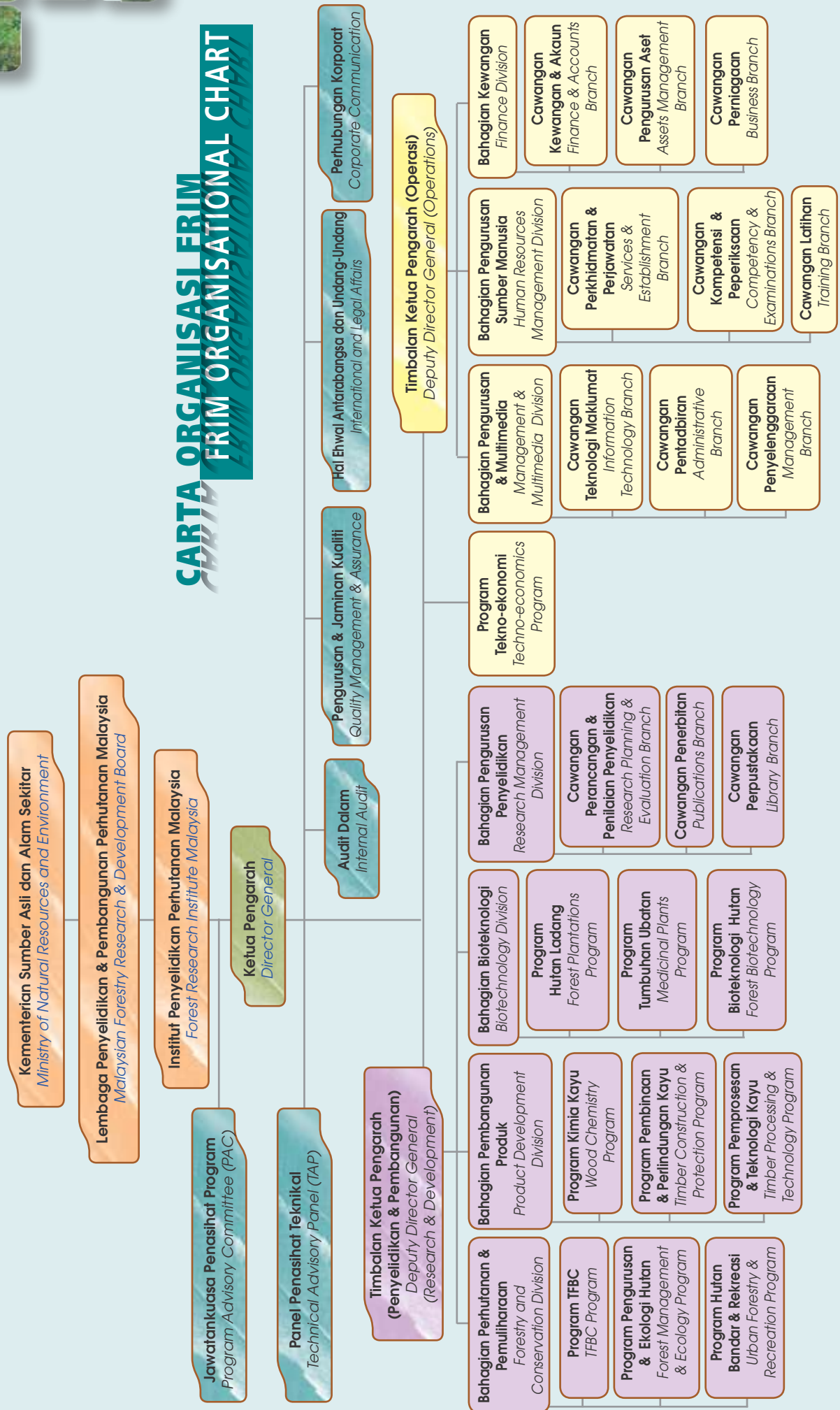
AHLI DIREKTORAT

DIRECTORATE MEMBERS



Dari kiri *From left*

Dr. Ab. Rasip Ab. Ghani, Dr. Mohd. Nor Mohd. Yusoff, Dr. Abdul Rashid Abd. Malik, En. Mohd. Zamshari Abd. Rahman, Dr. Saw Leng Guan, Dr. Rasadah Mat Ali, Dr. Rahim Sudin, Dr. Norini Haron, Pn. Wan Rahmah Wan A. Raof, Dato' Dr. Abd. Latif Mohmod, Dato' Dr. Abdul Razak Mohd. Ali (Ketua Pengarah), Dato' Dr. Wan Razali Wan Mohd., Dr. Tan Yu Eng, Dr. Shamsudin Ibrahim, Dr. Chan Hung Tuck, Dr. Abdul Rahim Nik, Dr. Baskaran Krishnapillay, Dr. Marzalina Mansor, Dr. Noor Azlin Yahya, Dr. Hoi Why Kong, Dr. Woon Weng Chuen



SLOGAN KUALITI QUALITY SLOGAN

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

VISI VISION

Menjadi pusat kecemerlangan dalam penyelidikan dan pembangunan perhutanan tropika dan keluaran hutan

To become a centre of excellence and distinction in tropical forestry research and development

MISI MISSION

Meningkatkan daya saing sektor perhutanan dan keluaran hutan melalui penyelidikan dan pembangunan (R&D) yang intensif, pengurusan yang efektif dan perkhidmatan yang cemerlang.

To enhance competitiveness of the forestry and forest product sectors through intensive research and development, effective management and excellent services.

OBJEKTIF OBJECTIVES

- Menjana pengetahuan saintifik bagi pemahaman, pengurusan dan penggunaan sumber hutan;
 - Mencapai kecemerlangan dalam menjalankan penyelidikan dan pembangunan dengan menggunakan alat saintifik termaju;
 - Menyediakan kepelbagaian biologi bagi menghasilkan produk berguna melalui penyelidikan dan pembangunan yang intensif;
 - Memajukan teknologi berkaitan bagi memenuhi keperluan industri perhutanan;
 - Mempakej hasil penyelidikan dan pembangunan untuk disebar kepada pelanggan;
 - Mengkomersial hasil penyelidikan dan pembangunan yang signifikan 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.
-
- *To generate scientific knowledge for the understanding, management and utilisation of forest resources;*
 - *To pursue excellence in conducting research and development using modern scientific tools;*
 - *To harness biological diversity for producing useful products through intensive research and development;*
 - *To develop relevant technologies to fulfill the needs of the forest industries;*
 - *To package the research and development results and disseminate them to clients;*
 - *To commercialize significant research and development results through technology transfer to any interested parties;*
 - *To provide excellent services to meet the needs of customers;*
 - *To establish collaborative strategies with national and international agencies;*
 - *To create public awareness of the importance of the environment and the conservation of forest biological diversity.*

FUNGSI FUNCTIONS

Fungsi dan aktiviti utama FRIM adalah:

- Untuk menjalan dan menganjurkan penyelidikan mengenai pembangunan sektor perhutanan dan pemuliharaan sumber hutan
- Untuk memperoleh dan menyebarkan maklumat berkaitan dengan pengurusan dan pembangunan perhutanan, hasil hutan dan penggunaan hasil hutan
- Untuk menyelaraskan penyelidikan berhubung dengan perhutanan dan penggunaan sumber hutan di dalam Malaysia dan mengadakan hubungan kerjasama dengan badan-badan di luar Malaysia berkaitan dengan perkara-perkara tersebut

The primary functions and activities of FRIM are:

- *To conduct and advance research towards development of the forest and forestry industries sector*
- *To obtain and disseminate information regarding the management and development of forestry, forestry products and their utilisation*
- *To co-ordinate research activities related to forestry and utilisation of forestry resources in Malaysia, and to facilitate co-operation and linkages with organisations outside Malaysia for the above matters*

PIAGAM PELANGGAN CLIENTS' CHARTER

Kami berjanji

Untuk berusaha membangun dan menggalakkan penggunaan sumber dan hasil hutan secara berkekalan melalui penyelidikan, pengembangan dan penggunaannya. Bagi tujuan ini, kami memberi jaminan seperti berikut:

- Menyediakan penyelesaian praktikal kepada masalah berkaitan pengurusan dan penggunaan sumber dan hasil hutan dengan tepat, jimat dan mengikut jadual
- Menyediakan satu program pembangunan sumber manusia bagi mewujudkan golongan saintis yang berkebolehan dan berwibawa
- Menyebarkan hasil teknologi, penyelidikan serta memberi perkhidmatan nasihat dan teknikal yang tepat dengan cepat secara profesional dan mudah difaham kepada setiap peringkat pengguna
- Menjamin untuk memberi kemudahan dan perkhidmatan profesional dalam meningkatkan kesedaran awam terhadap alam sekitar
- Menyediakan suasana kerja yang tidak birokratik bagi menggalakkan cetusan idea di kalangan saintis dan perhubungan lebih rapat dengan pelanggan

We pledge

To develop and enhance the utilisation of forestry resources and produce on a sustainable basis through research, development and application. For this purpose, we ensure the following:

- *Make available reliable, economical and timely solutions to problems related to management and utilisation of forestry resources and forestry produce*
- *Prepare a human resource development programme to create a core of dedicated scientists of calibre and ability*
- *Disseminate speedily appropriate and reliable scientific and technological information in a professional and easily accessible manner to all levels of clients and users through consultation and advice*
- *Provide professional advice to the public to ensure that public awareness on the environment is heightened*
- *Provide a conducive working environment to encourage creativity among scientists, and to maintain a close rapport with clients*

DASAR KUALITI QUALITY POLICY

Kami

bertanggungjawab untuk mencapai kecemerlangan dalam penyelidikan saintifik dan pembangunan dalam usaha pengembangan sektor perhutanan dan juga menghasilkan inovasi yang sesuai bagi semua pelanggan. Kami akan pastikan semua yang bekerja dengan kami bersama-sama bertanggungjawab dan mematuhi standard kualiti yang telah ditetapkan.

We

are committed to achieving excellence in scientific research and development in the efforts to develop the forestry industries sector and also to derive innovations for the benefit of the clients. We shall ensure that those working together with us shall be committed and adhere to the quality standards that have been identified.

SENARAI SPESIES PEMULIHAN

Senarai spesies pemulihan (senarai RS) yang dibuat pada tahun 1960 merupakan senarai spesies terpilih yang dianggap penting dari segi komersial dan silvikultur. Ia dapat menentukan sama ada keperluan minimum stok dapat dipenuhi serta sama ada hutan yang telah dibalok boleh dianggap sebagai terpulih atau sebaliknya semasa inventori selepas tebangan. Oleh yang demikian analisis data inventori selepas tebangan sama ada dari segi bilangan, kelas saiz, status atau kelas dominan dipengaruhi oleh kehadiran spesies-spesies ini. Walau bagaimanapun pasaran kayu-kayan telah mengalami perubahan — banyak spesies bukan RS telah diterima oleh pasaran sekarang. Justeru, senarai RS ini perlu disemak untuk memasukkan spesies bukan RS yang telah diterima umum serta berpotensi untuk memasuki pasaran dalam masa yang terdekat.

Mesyuarat MAJURUS ke-37 bersetuju untuk menubuhkan satu jawatankuasa yang terdiri daripada pegawai dan pakar dari FRIM, JPSM dan MTIB untuk menyemak semula senarai RS yang tidak pernah dikemas kini sejak tahun 1982. Satu jawatankuasa kerja yang diketuai oleh FRIM dibentuk bagi menyiapkan asas, kriteria serta analisis yang sesuai untuk dikemas kini. Kriteria yang digunakan ialah kegunaan akhir, kepadatan dan harga kayu. Pemarkahan dari 1 hingga 100 digunakan dalam analisis ke atas 578 spesies. Empat senario digunakan berdasarkan faktor pemberat yang berlainan. Jumlah pemarkahan setiap senario dikelaskan kepada 1 hingga 10. Spesies dengan jumlah peratusan yang tinggi diberi kedudukan yang lebih tinggi dan begitu juga sebaliknya. Hasil semakan ini telah dibentangkan pada mesyuarat MAJURUS yang ke-39. Mesyuarat bersetuju untuk membentangkan senarai baru ini di Persidangan Pengarah-Pengarah Perhutanan Negeri untuk sokongan sebelum dilaksanakan. Diharapkan senarai RS yang dicadangkan lebih mencerminkan spesies kayu-kayan yang perlu diuruskan pada masa sekarang dan akan datang bagi memenuhi keperluan bekalan bahan mentah kepada industri yang berasaskan kayu.

REGENERATION SPECIES LIST

The Regeneration Species (RS) List was developed in 1960. It consists of a list of selected species, which is considered important both for commercial and silvicultural purposes. It has been used for meeting minimum stocking requirements. It also serves as an indicator as to whether a recently logged-forest can be declared as regenerated or otherwise. As such the interpretation and analysis of post-felling inventory results will be influenced by the occurrence of these species in terms of numbers, size classes, status and dominant classes of the stocking. However the timber market has undergone changes such that many non-RS have now gained acceptance by the market. Hence the RS List needs to be revised to include many non-RS that have either been accepted or have market potentials in the near future.

During the 37th MAJURUS meeting, a committee comprising officials and experts from FRIM, FDPM and MTIB was formed to revise the RS List, which has not been updated since 1982. To facilitate the task, a working committee chaired by FRIM was formed to prepare a proper basis, criteria and analysis for the revision. The criteria used were end-use, wood density and log price. A ranking based on a scoring range from 1 to 100 was used for 578 tree species. Four scenarios were developed based on different weightage factors. A total scoring for each scenario was ranked by class intervals of 1 to 10. Species with higher total percentage was given a higher ranking and vice versa. Results of the revised RS List were presented during the 39th MAJURUS meeting. The meeting recommended that the new list be presented to the Conference of State Forest Directors for their endorsement before being implemented. It is envisaged that the proposed RS List will better reflect the current and future list of timber species that need to be managed for the supply of raw material to the wood-based industries.

PENGHASILAN JADUAL ISI PADU TEMPATAN TANPA MEROSAKKAN POKOK

Bagi membina jadual isi padu yang baik, jumlah sampel yang banyak daripada pelbagai kelas saiz dan kumpulan spesies diperlukan. Pengukuran diameter yang tepat ke atas setiap bahagian pendek batang pokok diperlukan.

Sebelum ini, pokok perlu ditebang terlebih dahulu untuk mengukur diameter mengikut panjang yang telah ditentukan. Sekarang, alat pengukuran yang dinamakan "Hand Held Laser Criterion" boleh digunakan untuk mendapatkan ketepatan ukuran yang sama tanpa perlu menebang atau memanjat pokok. Alat digital ini boleh mengukur diameter dan tinggi pokok dari lantai hutan. Bagi menguji ketepatan, satu kajian telah dijalankan

bagi memastikan sama ada terdapat perbezaan yang signifikan antara ukuran yang dibuat ke atas pokok tebang berbanding pokok berdiri dengan menggunakan alat ini. Beberapa pokok sampel (di atas dan di bawah had batas tebang) telah dipilih. Pengukuran diameter pokok berdiri dibuat pada setiap dua meter menggunakan alat ini. Pokok tersebut kemudian ditebang dan pengukuran secara manual dibuat menggunakan pita diameter. Keputusan analisis mendapati tiada perbezaan signifikan (pada selang keyakinan 95%) ke atas ukuran diameter menggunakan kedua-dua kaedah tersebut. Oleh yang demikian, alat ini boleh digunakan dalam pembinaan jadual isi padu tempatan. Penggunaan kaedah ini dapat mengurangkan kos dan kerugian akibat penebangan pokok di samping dapat mengekalkan ketepatan ukuran.

FLORA DI SEMENANJUNG MALAYSIA

Projek *Flora of Peninsular Malaysia* pada asalnya melibatkan kajian spesimen herbarium dan spesimen hidup, dan bukan sekadar kompilasi penerbitan terdahulu. Projek ini akan menghasilkan satu dokumentasi flora yang lengkap, terkini dan

DEVELOPING LOCAL VOLUME TABLES THE NON-DESTRUCTIVE WAY



Alat *Hand Held Laser Criterion* boleh mengukur diameter dan tinggi pokok dari lantai hutan
A Hand Held Laser Criterion device used for measuring diameter and length of trees from the ground

In order to construct a reliable volume table, a relatively large number of trees of various size classes, and species or species groups are sampled. The enumeration of each tree requires an accurate diameter measurement at fixed intervals along the tree trunk. Traditionally, trees were usually felled and diameters measured and recorded on the ground.

Currently, the same level of accuracy can be obtained without destructive sampling of trees by using the Hand-held Laser Criterion. This digital device measures the diameter and length of trees from the ground. To test the accuracy of the device, an experiment was

performed to determine whether there was any significant difference between measurements of felled trees using diameter tape and measurements of standing trees using the device. Results showed that there were no significant differences (at 95% confidence interval) using these two methods. The Hand-held Laser Criterion can therefore be used for developing local volume tables. The adoption of this non-destructive sampling approach does not compromise accuracy and is also more cost-effective.

FLORA OF PENINSULAR MALAYSIA

The Flora of Peninsular Malaysia is a project based on the study of herbarium and living specimens, rather than just being a compilation of previous publications. The project will produce a complete, updated and comprehensive documentation of about 8,300 vascular plant species based on original research. The plant species would include herbs, shrub and climbers. The project differs from The Tree Flora of Sabah and Sarawak in two ways. Firstly, the four parts of each volume will be published separately as accounts become available. Each part will comprise about 150 pages

menyeluruh yang merangkumi kira-kira 8,300 spesies tumbuhan vaskular bagi semua tumbuhan vaskular berdasarkan penyelidikan yang asli. Spesies tumbuhan termasuklah herba, pokok renek dan pepanjat. Projek *Flora of Peninsular Malaysia* berbeza daripada Projek *Tree Flora of Sabah and Sarawak* melalui dua cara. Pertama, keempat-empat bahagian pada setiap jilid akan diterbitkan secara berasingan, mengikut ketersediaan manuskrip. Setiap bahagian bakal memuatkan anggaran 100 spesies dengan kira-kira 150 halaman. Dengan itu, dianggarkan sebanyak 20 jilid akan dihasilkan bagi melengkapkan keseluruhan flora tersebut. Kedua, senarai pengecaman spesimen akan dihasilkan dalam bentuk cakera padat untuk membantu kurasi spesimen bagi herbarium-herbarium yang terlibat.



Mengkaji spesimen di Herbarium Singapura
Studying specimens in the Singapore Herbarium

PROJEK "PLANT RED LIST" MALAYSIA

Projek "Plant Red List" Malaysia merupakan projek usaha sama antara Institut Penyelidikan Perhutanan Malaysia (FRIM), Pusat Penyelidikan Perhutanan Sarawak, Pusat Penyelidikan Perhutanan Sabah, dan juga universiti-universiti. Projek ini di bawah naungan Kementerian Sumber Asli dan Alam Sekitar (NRE) dan dibiayai oleh Kerajaan Malaysia melalui Majlis Penyelidikan dan Kemajuan Sains Negara (MPKSN).

Sasaran projek ini ialah menilai status pemuliharaan dan ancaman terhadap spesies tumbuhan asli yang terdapat di Malaysia. Penilaian yang dibuat akan memberi penumpuan kepada spesies yang jarang ditemui, terancam dan hampir pupus

and include about 100 species. It will therefore take about 20 volumes to cover the entire flora. Secondly, identification lists of specimens will be issued as a CD to enable herbaria to readily curate their holdings.



Mengkaji rumput sewaktu kursus latihan
Studying grasses during a training course

MALAYSIA PLANT RED LIST PROJECT



Buku *Malaysia Plant Red List*
Malaysia Plant Red List book

The Malaysia Plant Red List is a collaborative project jointly undertaken by FRIM, the Forestry Departments of Sabah and Sarawak including the universities. Under the auspices of the Ministry of Natural Resources and Environment (NRE), the project is funded by the National Council for Scientific Research and Development (MPKSN).

The project is aimed at assessing the conservation status and threats of indigenous plant species in Malaysia. This assessment will highlight species that are rare, threatened and endangered. It will recommend strategies towards improving their conservation through enhancing the current

serta menghasilkan cadangan dan strategi bagi meningkatkan tahap pemuliharaan dan memperbaiki rangkaian kawasan perlindungan "in situ" dan "ex situ". Matlamat utama "Red List" ini adalah untuk menyampaikan maklumat mengenai tahap pemuliharaan yang terdapat untuk sesuatu spesies kepada orang ramai dan penggubal polisi serta memberi kesedaran kepada pihak berkuasa supaya melindungi spesies ini. Maklumat mengenai spesies dan ekosistem ini adalah amat penting dalam menuju ke arah penggunaan sumber asli secara mampan.

Penilai akan mencatatkan maklumat yang berkaitan menggunakan "The Taxon Data Information Sheet" (TDIS). TDIS merangkumi perkara yang berikut: Nama saintifik termasuk autoriti yang terperinci, pengelasan organisma secara mendalam; nama tempatan; habitat yang didiami; taburan geografi; corak penyebaran; kemerosotan populasi; ancaman; kategori dan kriteria "Red List"; asas yang logik atau rasional (termasuk sebarang data atau hasil kesimpulan yang dibuat berkaitan dengan kriteria yang ada); tahap semasa pemuliharaan; penggunaan; bahan rujukan yang digunakan semasa membuat penilaian; maklumat diri penilai; tarikh penilaian dilakukan dan proses ulasan atau kajian semula (nama penaksir).

KETAHANAN SEMULA JADI BEBERAPA SPESIES KAYU TEMPERAT

Projek ini menguji kayu-kayan temperat yang terpilih di tapak ujian pancang yang sedia ada di FRIM menggunakan protokol ujian yang dilaporkan Foxworthy (1930) dan Jackson (1957). Dengan cara ini, keputusan yang dikumpulkan boleh dibandingkan dengan keputusan terdahulu yang dilaksanakan dalam persekitaran yang sama. Empat jenis kayu dari setiap kumpulan kayu keras (*Fagus sylvatica*, *Fraxinus americana*, *Quercus rubra* dan *Quercus alba*) dan kayu lembut (*Tsuga heterophylla*, *Pseudotsuga menziesii*, *Picea abies* dan *Pinus sylvestris*) telah dipilih untuk kajian ini. Untuk perbandingan, *Kompassia malaccensis*, salah satu daripada kayu tropika yang paling popular dan dikategorikan dalam kumpulan ketahanan sederhana, dipilih sebagai sampel kawalan.

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 protect species. Information about species and ecosystems is essential towards sustainable use of our natural resources.

Assessors would have to record relevant information using Taxon Data Information Sheets (TDIS). Sections of the TDIS are: Scientific name including authority details; taxonomy details; common names in other languages; habitat preferences; geographical range; general distribution pattern; population decline; threats; Red List Category and Criteria; rationale for listing; current conservation measures; utilization; literature used in the assessment; details of assessor(s); date of assessment and review process (names of evaluators).

NATURAL DURABILITY OF SOME TEMPERATE TIMBER SPECIES



Sampel kayu di Petak Ujian Bukit Watson, FRIM, selepas penanaman
Wood samples at Bukit Watson Test Plot, FRIM, after planting

*The study involved the testing of selected temperate timbers at existing graveyard testing sites in FRIM using the same test protocol developed by Foxworthy (1930) and Jackson (1957). Comparisons were made with some Malaysian timbers. Thus, the results would be comparable to those obtained in the past, as the test was performed under similar environmental conditions. Four species of temperate timber from each group of hardwoods (*Fagus sylvatica*, *Fraxinus americana*, *Quercus rubra* and *Quercus alba*) and softwoods (*Tsuga heterophylla*, *Pseudotsuga menziesii*, *Picea abies*)*

Selepas pendedahan terhadap ujian pancang selama 12 bulan, semua kayu lembut dan kayu keras temperat telah musnah melebihi 50% daripada keratan rentas sampel oleh organisma penguraian/perosak kayu seperti anai-anai bawah tanah. Hanya *Quercus rubra* yang masih bertahan. Walau bagaimanapun, *Kompassia malaccensis* hanya mengalami sedikit kesan serangan pada bahagian permukaannya yang menunjukkan ia lebih tahan kepada anai-anai bawah tanah berbanding dengan semua kayu temperat.



Beberapa sampel kayu yang diserang anai-anai
Some of the wood samples were attacked by termites

TEKNIK LUMEN BERPENGISI DALAM PENGHASILAN KERTAS DARIPADA SERABUT TANDAN KOSONG KELAPA SAWIT

Teknik lumen berpengisi merupakan suatu pendekatan fizikal yang menempatkan pengisi pada bahagian dalaman gentian melalui lumen dan bukaan-bukaan pit. Berbeza dengan teknik konvensional, ketiadaan pengisi pada permukaan luar gentian mengujia lebih banyak ikatan antara gentian yang menghasilkan kertas yang lebih kuat. Dengan itu, penggunaan teknik lumen berpengisi akan mengurangkan kos penggunaan bahan penambah, contohnya kanji kation untuk memulihkan kekuatan kertas.

Bagi mencapai objektif lumen berpengisi untuk gentian tandan kosong kelapa sawit, saiz pengisi mestilah kurang daripada saiz bukaan-bukaan pit. Saiz pengisi yang sesuai adalah penting untuk membenarkan kemasukan pengisi melalui kedua-dua lumen dan bukaan-bukaan pit gentian. Pada masa ini, para saintis FRIM telah menguji beberapa pengisi yang mungkin mempunyai ukuran yang



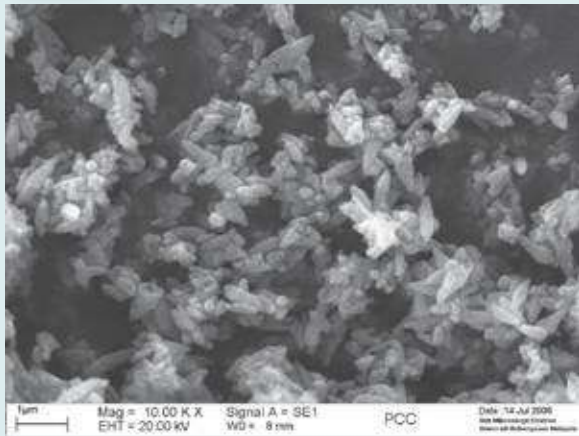
Kandul spora kulat pereput kayu di atas sampel kayu yang terdedah
Fruiting body of wood decaying fungus on exposed wood sample

and *Pinus sylvestris*) were selected for this study. For comparison purposes, *Kompassia malaccensis* was selected as control. It is one of the most popular tropical timbers and categorised as moderately durable. After exposure for 12 months, both the softwood and hardwood groups of temperate timbers were destroyed mainly by subterranean termites for more than 50% of the cross section of the sample. The only exception was *Quercus rubra*, which showed slightly better resistance. However, *Kompassia malaccensis*, was just slightly attacked on the wood surface and thus showed much better resistance against subterranean termites when compared to all the temperate timbers tested.

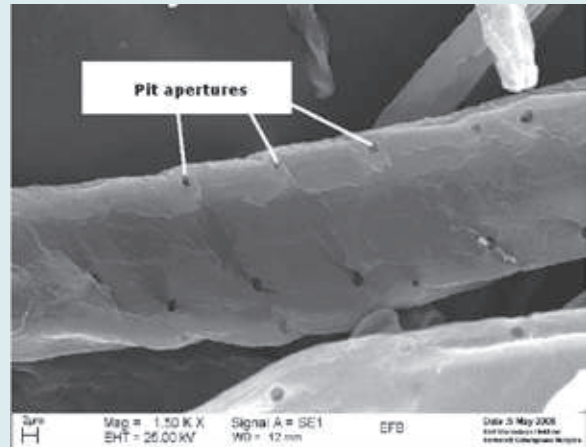
LUMEN LOADING TECHNIQUE FOR MAKING PAPER FROM OIL PALM EFB

Lumen loading is a technique where fillers are deposited into the inner part of a fibre via its lumen and pit apertures. This technique has several advantages over conventional techniques. First, it increases paper strength. Fillers are deposited into inner parts of fibres leaving the outer surface to increase inter-fibre bonding. Second, lumen loading reduces the use of cationic starch, an additive used to increase paper strength, which is expensive.

In order to meet the objective of lumen loading for oil palm EFB fibres, the size of fillers has to be less than the size of EFB fibre pit apertures. The suitable size of fillers is important to permit the entry of fillers via both fibre lumens and pit apertures. Currently



Pengisi yang dilihat melalui SEM
Fillers viewed via SEM



Bukaan pit di atas serabut EFB
Pit apertures of an EFB fibre

mbolehkannya dimasukkan ke bahagian dalam serabut EFB.

FRIM scientists have embarked on the testing of a number of fillers, which have the required filler size to be deposited into the inner part of EFB fibres.

PENGHASILAN KARBON TERAKTIF DARIPADA BULUH



Arang
Charcoal

Karbon teraktif merupakan salah satu bahan penyerap yang telah digunakan secara meluas. Sejak beberapa dekad yang lalu, sistem penyerapan yang melibatkan karbon teraktif menjadi penting dalam proses penapisan dan pemisahan pada skala industri. Karbon teraktif boleh digunakan untuk memindah dan menyingkirkan bahan kimia organik, klorin, plumbum, bau dan rasa yang kurang menyenangkan pada kotoran atau bahan pepejal berwarna daripada aliran gas dan cecair melalui mekanisme penyerapan. Ciri-ciri karbon teraktif bergantung pada sifat-sifat fizikal dan kimia serta cara pengaktifannya .

Walaupun penggunaannya telah meluas, karbon teraktif komersial masih lagi merupakan bahan yang mahal. Ini menyebabkan bahan penyerap berkos rendah yang lain dicari sebagai alternatif. Antara alternatif ini, sisa pertanian dan hutan seperti habuk kayu, tempurung kelapa dan



Buluh semantan
Gigantochloa scortechinii

PRODUCTION OF ACTIVATED CARBON FROM BAMBOO

Activated carbon is one of the most widely used adsorbents. Over the last few decades, adsorption systems involving activated carbon have gained importance in purification and separation processes on industrial scale. Activated carbon can be used to remove organic chemicals, chlorine, lead, unpleasant tastes and odors in effluent or coloured substances from gas or liquid streams by the mechanism of adsorption. The characteristics of activated carbon depend on the physical and chemical properties of the precursor as well as on the activation method.

Despite its use in many applications, commercial activated carbon remains expensive. This has led to a search for low-cost materials as alternative adsorbents. Among these alternatives, agricultural and/or forest residue such as sawdust, coconut shell and palm kernel shell appear to be more economically attractive in certain countries because of their abundant supply.

cengkerang isi buah kelapa sawit muncul sebagai tarikan ekonomi di sesetengah negara kerana ia boleh didapati dengan banyaknya.

Satu kajian telah dijalankan untuk menghasilkan karbon teraktif daripada buluh (*Gigantochloa scortechinii* atau buluh semantan) menggunakan pengaktifan zink klorida. Bahan ini direndam dengan kepekatan $ZnCl_2$ yang menaik (20, 50 and 70%) diikuti dengan suhu pengaktifan 800°C, 850°C and 900°C dalam masa (1, 2 dan 3 jam). Parameter proses ini dioptimumkan berpandukan hasil produk dan nilai iodin.

Didapati bahawa nilai iodin karbon teraktif buluh meningkat dengan peningkatan suhu pengaktifan. Bagaimanapun, suhu di atas daripada 850°C menyebabkan penurunan dalam kapasiti penyerapan. Kapasiti penyerapan ini ditingkatkan dengan menaikkan jumlah $ZnCl_2$ tetapi $ZnCl_2$ yang berlebihan akan menurunkan nilai iodin. Selain itu, kajian mendapati bahawa hasil karbon teraktif akan berkurangan dengan kenaikan suhu dan masa pengaktifan.

GEOTEKSTIL SERAT SEMULA JADI UNTUK MENYOKONG PERTUMBUHAN VEGETATIF



Tikar serat EFB sebelum dirawat
EFB fibremats before application

Bahan serat semula jadi seperti serat kelapa dan jut dalam pembuatan geotekstil telah digunakan secara meluas dalam geotekstil sebagai bahan penahan hakisan permukaan tanah sementara ke atas cerun yang baru dipotong. Bahan ini berfungsi sebagai sungkupan dan media bagi percambahan dan pertumbuhan rumput atau tumbuhan semula jadi cerun itu. Di sepanjang lebuhraya yang baru dibina, geotekstil ini digunakan secara meluas sebagai bahan

*A study was conducted to produce activated carbon from bamboo (*Gigantochloa scortechinii* or Buluh semantan) by zinc chloride activation. The material was soaked with increasing concentrations of $ZnCl_2$ (20, 50 and 70%) and followed by activation at temperatures of 800°C, 850°C and 900°C for 1, 2 and 3 h. The process parameters were optimized based on product yield and iodine value.*

It was observed that the iodine value of the bamboo activated carbon increased with increasing activation temperature. However, temperature higher than 850°C resulted in the decrease in adsorption capacity. The adsorption capacity was enhanced with increasing of amounts of $ZnCl_2$. However, excessive $ZnCl_2$ caused a decrease in the iodine value. In addition, it was found that the yield of activated carbon generally decreased with increasing activation temperature and time.



Karbon teraktif
Activated carbon

NATURAL FIBRE GEOTEXTILES FOR BETTER VEGETATIVE GROWTH



Rumput bermuda yang tumbuh di atas tikar serat EFB sebulan selepas rawatan
Bermuda grass grown on EFB fibremats one month after application

Natural fibres such as jute, coconut coir and straw are widely used in geotextiles for soil surface erosion control on newly cut slopes. These natural geotextiles are in the form of fibremats and acts as

penahan hakisan permukaan tanah. Di Malaysia, serat daripada tandan kosong kelapa sawit (EFB) digunakan dalam pembuatan geotekstil, tetapi kurang berkesan dalam menampung pertumbuhan rumput berbanding geotekstil yang dibuat daripada serat kelapa yang telah digunakan secara meluas.

Satu kajian telah dijalankan di FRIM bagi menambah baik geotekstil yang diperbuat daripada serat EFB ini dalam menyokong pertumbuhan rumput. Hasilnya didapati amat memberangsangkan. Geotekstil EFB bersaiz 30 x 60 x 1.5 cm yang dirawat dengan bahan nutrien dan bahan penggalak pertumbuhan semula jadi telah dikaji keberkesanannya untuk menampung percambahan dan pertumbuhan rumput bermuda. Rawatan penggalak tumbuhan semula jadi memberikan peningkatan berat kering rumput (DMW) yang ketara selepas satu bulan iaitu peningkatan sebanyak 95% berbanding rawatan kawalan. Rawatan lain menunjukkan peningkatan DMW dalam julat 48-104% berbanding rawatan kawalan. Dari sudut penggunaan secara komersial, penggunaan bahan penggalak semula jadi ini adalah lebih menjimatkan. Percubaan di lapangan menggunakan geotekstil EFB yang dirawat dan bersaiz komersial akan dijalankan ke atas cerun dan kesannya terhadap hakisan permukaan tanah dan pertumbuhan rumput akan dikaji berbanding geotekstil EFB yang tidak dirawat.

a mulch and also growth media for germinating grass or natural vegetation. They have been used extensively especially along highways where controlling soil surface erosion. In Malaysia, oil palm EFB has been used for making natural fibre geotextiles. However, its performance in supporting grass growth was inferior to coconut fibremats, which have been widely accepted worldwide as a material in natural fibre geotextiles.

A study was conducted in FRIM with the aim of improving the performance of EFB fibremats in supporting grass growth. Results were promising. Treatments carried out on the fibremats of dimensions 30 x 60 x 1.5 cm included the addition of nutrients, improving the fibre physical properties and the addition of natural growth activator. All treatments enhanced the growth of Bermuda grass. Of the treatments, the addition of natural growth activator resulted in a 95% increase in dry matter weight (DMW) of grass after 4 weeks compared to the control. Addition of nutrients showed increase in DMW in the range of 48-104%. It is anticipated that the use of natural growth activator is more economical and commercially viable compared to the addition of nutrients into the fibremats. Field trials on slopes will be carried out using the improved EFB geotextile to evaluate its performance in controlling surface runoffs as compared to the untreated EFB geotextile.

PEMBANGUNAN PAPAN LAPIS YANG DIRAWAT DENGAN PERENCAT API

Panel komposit kayu seperti papan lapis, papan serpai, papan blok, papan berperekat-simen dan slab gentian kayu digunakan secara meluas dalam industri binaan. Kebanyakannya digunakan sebagai komponen bukan struktur seperti sistem dinding, lantai dan siling. Namun demikian, panel komposit yang tidak dirawat ini bersifat mudah terbakar dan tidak memenuhi sepenuhnya keperluan keselamatan api. Papan lapis yang tidak dirawat bersifat lebih kurang sama dengan kayu padu iaitu kadar pembentukan arang ialah 0.6 mm seminit dan kadar rebakan api Kelas 3.

Dalam kajian ini, papan lapis Meranti sarang punai (MSP) telah dirawat dengan bahan perencat api. Monoamonium fosfat (MAP), diamonium fosfat (DAP), dricon dan borax asid borik (BBA) telah dimasukkan ke dalam papan lapis melalui



Ujian rebakan api
Flame spread test

DEVELOPMENT OF FIRE RETARDANT TREATED PLYWOOD

Wood composite panels such as plywood, chipboard, block-board, cement-bonded board and wood-wool slab are widely used in the building industry. They are mainly used for non-structural components such as partition, flooring system and ceiling. Unfortunately, these composite panels,

kaedah rawatan tekanan. Kemasukan bahan kimia yang disasarkan adalah pada julat 50 hingga 80 kg m⁻³. Keputusan ujian sifat fizikal dan mekanikal menunjukkan papan lapis yang dirawat memenuhi Piawaian Pertanian Jepun untuk Papan Lapis (JAS : 2003 MAFF 233). Kadar rebakan api telah meningkat dari kelas 3 kepada kelas 1 untuk kesemua papan lapis yang dirawat.

Dalam ujian perambatan api, papan lapis MSP yang dirawat dengan DAP menghasilkan indeks keupayaan 9.7 yang boleh diklasifikasikan dalam Kelas 0. Rawatan tiga bahan kimia yang lain memenuhi tahap Kelas 1. Papan lapis yang tidak dirawat pula adalah dalam Kelas 2. Berdasarkan keputusan ujian tersebut papan lapis MSP yang dirawat dengan DAP, MAP, BBA dan dricon boleh digunakan sebagai komponen bangunan seperti yang tercatat dalam 'Uniform Building By Law' 1984.

PENGERINGAN KAYU KERAS RINGAN CAMPUR

Terdapat lebih kurang 30 kumpulan kayu keras ringan diniagakan dalam pasaran tempatan. Kadang-kadang sebilangannya dicampurkan sekali, kadang-kadang dicampur dengan kayu ringan kurang terkenal lain, dan diniagakan sebagai 'chap char' atau kayu keras ringan campur. Biasanya, kayu keras ringan digunakan untuk pembuatan produk dalaman seperti perabot. Bagaimanapun, jika produk itu adalah untuk dieksport atau untuk kegunaan di kawasan dalaman yang berhawa dingin, kayu mestilah dikeringkan dengan tanur.

Pada masa sekarang, jadual pengeringan kayu sedia ada yang disyorkan untuk satu-satu kumpulan kayu tidak sesuai digunakan untuk pengeringan kayu campuran. Pelbagai pendekatan dikaji dan ujian pengeringan dijalankan terhadap kayu keras ringan campuran dengan menggunakan tanur pengeringan stim konvensional. Untuk menyenangkan penggunaan di tapak, pengasingan kayu keras ringan kepada tiga kelompok pengeringan dicadangkan (berketumpatan ringan, sederhana dan berat) berdasarkan ketumpatan dan kumpulan kayu tersebut. Dengan menggunakan jadual pengeringan terbitan yang berkenaan, masa pengeringan untuk kelompok masing-masing ialah 4, 7 dan 12 hari dari kayu berkeadaan basah hingga 12% kandungan

being combustible in nature, do not meet some of the fire safety requirements. The fire performance of untreated plywood is more or less equal to solid wood, i.e. it carbonizes at the rate of 0.6 mm per minute and generally has a flame spread rating of Class 3.

In this study, Meranti sarang punai (MSP) plywood was treated with fire retardant chemicals. Monoammonium phosphate (MAP), diammonium phosphate (DAP), dricon and borax boric acid (BBA) were impregnated into the plywood using the pressure treatment method. The targeted chemical loadings were in a range between 50 and 80 kg m⁻³. Results of physical and mechanical properties indicated that treated MSP plywood met the Japanese Agriculture Standard for Plywood (JAS : 2003 MAFF 233). The flame spread rating had improved from Class 3 to Class 1 for all the treated MSP plywood.

In the fire propagation test, MSP plywood treated with DAP had the highest performance index of 9.7 which can be classified Class 0. The other three chemicals tested fall into Class 1. Untreated MSP plywood falls into Class 2. Based on these results, MSP plywood treated with DAP, MAP, BBA and dricon can be used for building components as stated in Uniform Building By Law 1984.

DRYING MIXED LIGHT HARDWOODS

There are some 30 light hardwood groups traded locally. At times, some are lumped together, sometimes with other lesser-known timber, and traded as "chap char" or mixed light hardwoods. Normally, light hardwoods are used for making indoor products such as furniture. However, if the end product is meant for export or used in air-conditioned indoor environment, it is essential to kiln-dry the timber.

At present, the recommended drying schedules for a single timber-group drying are not suitable for the mixed charge drying. Various approaches were evaluated and drying trials were conducted using the conventional steam heated kiln for the drying of mixed light hardwoods. For ease of implementation at site, segregation of light hardwoods into three drying groups (low, medium and high density) based on basic density is

lembapan dapat dicapai. Memandangkan pembentukan kecacatan pengeringan meningkat dengan pengeringan kayu campur, pemantauan yang rapi sepanjang proses pengeringan amat penting.

PENGERINGAN KAYU GETAH MENGGUNAKAN SUHU TINGGI

Penggunaan sistem pengeringan suhu tinggi secara komersial bagi kayu-kayan keras Malaysia masih belum diketahui. Walau bagaimanapun, permintaan terhadap proses ini daripada pengeksport, pengeluar serta pengusaha tanur telah mendorong FRIM untuk menyiasat pelbagai aspek teknikal terhadap reka bentuk dan instrumentasi kawalan sistem untuk membangunkan suatu proses pengeringan suhu tinggi yang berkesan untuk mengeluarkan kayu gergaji kering-tanur yang berkualiti daripada kayu getah khususnya, dan kayu-kayan keras Malaysia yang berketumpatan rendah ke sederhana umumnya, yang sesuai untuk pemprosesan hiliran.

Sebuah prototaip sistem pengeringan suhu tinggi bersaiz komersial telah direka bentuk dan disuai-pasang pada pertengahan tahun 2005. Usaha R&D fasa pertama FRIM telah dijalankan dengan jayanya dan hasil kajian menunjukkan bahawa kayu getah hanya memerlukan satu perlima daripada masa pengeringan konvensional untuk dikeringkan. Secara keseluruhannya, mutu kayu yang dihasilkan adalah memuaskan dengan kestabilan dimensi yang lebih baik. Fasa akhir kajian yang melibatkan pelbagai penyesuaian



Sebuah prototaip sistem pengeringan suhu tinggi
A commercial prototype of the HTD system



Pengeringan kayu keras ringan campur di dalam pengering eksperimen
Drying of mixed light hardwood in an experimental dryer

proposed. By using the appropriate derived drying schedules for these drying groups, the drying times for the respective groups were 4, 7 and 12 days from green to about 12% moisture content could be achieved. As the occurrence of drying defects may increase with mixed timber-groups drying, regular monitoring during the drying process is important.

HIGH TEMPERATURE DRYING OF RUBBERWOOD

The commercial use for high temperature drying (HTD) for Malaysian hardwoods is still unknown. However, the interest in this process arising from enquiries of exporters, manufacturers and kiln operators had prompted FRIM to investigate the various technical aspects of system design and control instrumentation. The investigation is also aimed to find out whether an effective HTD process could be developed for high throughput of quality kiln dried lumbers from rubberwood and other lower to medium density range Malaysian hardwoods, suitable for downstream processing.

A commercial prototype of the HTD system was designed and installed in 2005. The first phase of the FRIM's R&D effort has been successfully carried out and results showed that rubberwood required only one-fifth of the time to dry as compared to the conventional kiln. The quality of timber was generally good and offered better dimensional stability. The final phase involving various hardware inter-phasing and control instrumentation for a full-fledged commercial size HTD system has been completed and the system is currently undergoing 'dry' testing. To-date, two rubberwood-based manufacturers have indicated their intention to

perisian keras serta instrumentasi kawalan untuk sistem pengeringan suhu tinggi telah selesai dan pengujian keberkesanan untuk operasi sistem ini sedang dijalankan. Setakat ini, dua pengeluar yang berasaskan kayu getah telah menyatakan hasrat mereka untuk memproses stok kayu getah berdimensi untuk pengeluaran perabot berdasarkan hasil inovasi FRIM. Pada dasarnya, mereka telah bersetuju untuk menggunakan sistem pengeringan suhu tinggi ini di kilang masing-masing sementara perbincangan tentang reka bentuk dan aspek kewangan tentang pemindahan teknologi ini diteruskan.

Projek ini telah menerima Anugerah Inovasi Penyelidikan Bersama antara Sektor Awam dengan Sektor Swasta (AIPB) 2005, pingat emas dalam Malaysia Technology Expo 2006 (Kategori: Alam Sekitar, Tenaga and Perlindungan), pingat emas dalam ITEX 2006 (Kategori: Proses Pengeluaran/ Perkilangan) dan Anugerah Penyelidikan Terbaik FRIM 2006.

KEMBARA PEMBANGUNAN AGEN ANTI-MRSA

Staphylococcus aureus ialah sejenis bakteria oportunistik penyebab pelbagai jenis jangkitan; daripada jangkitan yang kecil seperti jerawat sehinggalah kepada yang lebih teruk dan boleh membawa maut seperti keracunan, jangkitan luka, pneumonia dan sindrom renjatan toksik. Evolusi berterusan sifat rintang pada *S.aureus* mewujudkan isolat-isolat rintang pelbagai dadah yang lebih dikenali sebagai *multidrug resistant S.aureus (MRSA)* atau 'superbug'. Di Amerika sahaja, kos intervensi yang diperlukan bagi jangkitan bakteria rintang pelbagai dadah mencecah USD4 hingga 5 bilion setahun.

Inisiatif untuk membangunkan agen anti-MRSA di kalangan penyelidik Bahagian Tumbuhan Ubatan bermula dengan satu pencerakinan yang mudah iaitu cakera-resapan agar. Sehingga kini sebanyak 11 pencerakinan berbeza yang lebih rumit telah berjaya diwujudkan bagi memantapkan usaha menilai tumbuhan tropika yang berpotensi sebagai agen perencat MRSA. Menjangkakan penularan isolat *S. aureus* sederhana rintang atau lebih teruk lagi, rintang terhadap Vancomycin (VISA dan VRSA) potensi perencatan formulasi biasanya dibandingkan dengan potensi perencatan vancomycin bagi mengenal pasti formulasi berpotensi antiVISA dan

process rubberwood for furniture production using FRIM's innovation. They have in principle agreed to adopt the HTD system in their respective mills pending further discussions on the design and mode of financial arrangement.

This project was awarded the 'Anugerah Inovasi Penyelidikan Bersama antara Sektor Awam dengan Sektor Swasta 2005' (Category: R&D Collaboration with Private Sector), gold medal award in Malaysia Technology Expo 2006 (Category: Environment, Energy and Protection), gold medal award in ITEX 2006 (Category: Manufacturing Process) and FRIM's Best Research Award 2006.



Sampel kayu getah untuk pengeringan
Rubberwood samples prepared for drying

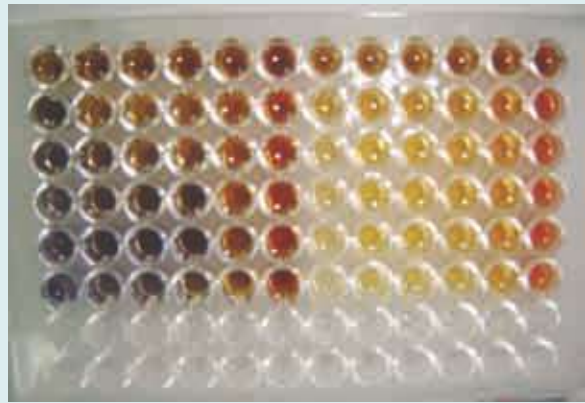
ANTI-MRSA AGENT DEVELOPMENT ODYSSEY

Staphylococcus aureus is an opportunistic bacterium that can cause various types of infections from mild skin infections such as acne to serious conditions such as food poisoning, wound infections, pneumonia, and toxic shock syndrome. Multidrug Resistant *Staphylococcus aureus (MRSA)* or the 'superbug' meanwhile is a result of continuous evolution on the resistance trait amongst this bacterium. These super bugs amongst other multidrug resistant bacteria are costing the American Health Industry USD4 to 5 billion per annum.

*The initiative to develop anti-MRSA agents at the Medicinal Plants Division in FRIM began with a simple disc-diffusion assay. To-date, eleven more advanced assays have been established to screen tropical plants for potential anti-MRSA agents. Anticipating the widespread presence of vancomycin intermediate *S. aureus (VISA)* or the more dangerous Vancomycin Resistant *S. aureus**



Beberapa ekstrak tumbuhan yang disaring untuk mendapatkan ciri-ciri anti-MRSA
Some of the plant extracts screened for their anti-MRSA properties



Dua sebatian fito dinilai melalui cerakan "checkerboard"
Two phyto-compounds evaluated via the 'checkerboard' assay

anti-VRSA sebagai suatu persediaan awal untuk berhadapan dengan isolat-isolat tersebut.

Hampir 500 ekstrak dan juga bahan fitokimia telah berjaya dikaji. Enam rumusan telah menunjukkan potensi perencatan yang ketara terhadap isolat-isolat MRSA pada pelbagai tahap kerintangan terhadap vancomycin. Rumusan tersebut sedang dinilai dari aspek farmakodinamikanya bagi menentukan regim dos terapeutiknya.

GARCINIA ATROVIRIDIS PADA DIMENSI BARU

Garcinia atroviridis atau Asam gelugor secara tradisinya digunakan sebagai perasa di dalam makanan. Kepingan kering ini digunakan secara terus di dalam masakan. Ia juga digunakan untuk merawat batuk dan sakit tekak serta mengawal berat badan.

Analisis kimia menunjukkan ekstrak buahnya mengandungi beberapa bahan kimia yang berpotensi untuk dijadikan produk kesihatan. Asid Hidroksisitik (HCA) didapati berkesan dalam mengawal berat badan. Bagi mendapatkan HCA dalam kuantiti yang banyak, pemprosesan berskala besar-besaran telah dijalankan.

Di pusat pemprosesan, buah diasingkan mengikut grad. Air mentah digunakan untuk pembersihan dan dibilas dengan air bertapis bagi mengurangkan pencemaran. Buah segar yang bersih ini dibiarkan seketika sebelum dipotong dalam bentuk kepingan (ketebalan 1-3 mm) menggunakan mesin pemotong.

(VRSA) isolates amongst the existing MRSA isolates, these assays on selected tropical plants have also been used to identify potential anti-VISA and anti-VRSA formulations as an early measure.

Currently up to 500 extracts and/or phyto-compounds have been evaluated. Six formulations have showed potential against MRSA isolates with varying degrees of resistance to Vancomycin. The formulations are now undergoing pharmacodynamic assessments to partially ascertain the therapeutic dose regime.

GARCINIA ATROVIRIDIS ON NEW DIMENSION

Garcinia atroviridis or Asam gelugor is traditionally used in flavoring food. Dried fruit slices are used as food additives. It is used to treat coughs and sore throats. It is also used for controlling body weight.

Chemical analysis of its fruit extract showed a number of chemical compounds with great potential to be developed into health products. Hydroxycitric acid (HCA) has been found to be effective in weight maintenance. In order to obtain HCA in large quantities, a pilot-scale processing of Asam gelugor is currently underway.

In the processing center, fruits are separated according to grade and cleaned. Raw water is used for cleaning with final rinsing using Reverse Osmosis water to reduce contamination. Cleaned fruits are left to dry and are then cut into slices of 1-3 mm thickness using a cutter machine. The moisture content in these small pieces is about

Kandungan lembapan kepingan-kepingan nipis ini ialah 50-70% air. Kepingan akan dimasukkan ke dalam bekas berisi air bersuhu 40-45 °C selama 10-15 minit bagi menyekat aktiviti enzim. Kepingan ini dimasukkan di dalam alat pengering sehingga kandungan lembapan mencapai 10%. Kepingan yang sudah kering dimasukkan ke dalam bekas bertutup dan disimpan di dalam bilik sejuk.

Sebelum proses pengekstrakan, buah yang telah kering dihancurkan kepada saiz 5-10 mm bagi mengoptimalkan interaksi dengan pelarut. Pengekstrakan merupakan proses yang terpenting dalam penghasilan ekstrak piawai asam gelugor. Di Pusat Teknologi Herba (HTC), proses pengekstrakan HCA menggunakan *Extractor* berdasarkan parameter yang telah ditetapkan dalam kajian yang terdahulu. Parameter atau keadaan operasi yang utama termasuklah pelarut, sukatan nisbah jisim bahan dengan pelarut, saiz partikel pulpa buah, suhu dan tempoh.

Selepas proses pengekstrakan, campuran sampel dan pelarut akan dikeluarkan daripada vesel utama dan dicurahkan ke dalam penapis. Larutan ekstrak akan dipam semula ke dalam vesel utama dan dicurahkan semula ke atas sampel yang tidak larut tadi. Proses ini dijalankan sebanyak tiga kali supaya partikel yang tidak larut dibuang sepenuhnya sebelum larutan ekstrak ini disalurkan ke mesin *Evaporator*. Sementara itu, sampel ini akan menjalani proses pemerahan untuk mendapatkan kembali ekstrak menggunakan alat pemerah iaitu *Screw Press Machine*. Proses pemerahan dibuat sehingga kandungan ekstrak dalam residu menurun sehingga 5-10%. Proses pemekatan sampel larutan ekstrak ini adalah untuk meningkatkan kandungan padu larutan ekstrak daripada 2-3% kepada 20-30%.



Tunas dan bunga Asam gelugor
Buds and flower of Asam gelugor



Buah Asam gelugor yang muda dan yang matang
Young and mature fruits of Asam gelugor

50-70% wt/wt. Sliced fruits are soaked in warm water (40-45°C) for 10-15 minutes to stop enzyme activity. They are then oven-dried until the moisture content is 10%. Dried fruit slices are kept in closed container and stored in a cold room.

Before the extraction process, dried fruits are ground to a particle size of 5-10 mm to optimize the interaction with the solvent. The extraction process is the most important step in the production of standardized extracts of Asam gelugor. HCA, the targeted chemical compound is extracted in an *Extractor*, situated at FRIM's Herbal Technology Center (HTC) using parameters set in previous studies. The parameters or key operating conditions include solvent, ratio of sample to solvent, particle size of fruit pulp, temperature, and duration.

When extraction is completed, the mixture is discharged from the main vessel into a filter basket to separate the residual particles. The filtrate is pumped back into the main vessel and then discharged again from the main vessel. The step is repeated three times so that the residual particles can be removed thoroughly. The filtrate is then concentrated using an *Evaporator*. Meanwhile the residues which still contain a certain amount of extract is pressed to recover the extract. This process is carried out using a *Screw Press Machine* until the moisture content of the residues reaches 5-10% wt/wt. The concentration of filtrate with the *Evaporator* increases the solid content of the extract from 2-3% to 20-30%.

The concentrated extract is then dried till 4% moisture content using a *Freeze Dryer*. The dried extract in the form of a cake is then ground with a *Particle Size Reducer* to produce a fine powder. The powder is then sent to the Quality

Larutan ekstrak pekat akan dikeringkan sehingga 4% kandungan lembapan menggunakan Freeze Dryer. Ekstrak berbentuk kek kering ini dihancurkan menggunakan alat pengisar untuk membentuk debu halus. Sedikit sampel kering ekstrak ini dihantar ke Makmal Kawalan Kualiti bagi menentukan penanda kimia, bioaktiviti dan ketoksikan. Ekstrak piawai ini boleh digunakan untuk merumus produk-produk lain seperti produk farmaseutikal, minuman, dan perasa makanan. Nova Laboratories Sdn. Bhd. dengan kerjasama FRIM sedang memasarkan produk ini dan telah mendapat kelulusan daripada pihak Kementerian Kesihatan.



Produk-produk dari Makmal Nova yang menggunakan ekstrak Asam gelugor
Some products from Nova Laboratories using Asam gelugor extracts

SEBATIAN ANTIBAKTERIA DARIPADA KULAT BASIDIOMISET YANG DIKAITKAN DENGAN PENYAKIT TUMBUHAN

Basidiomiset ialah satu kumpulan kulat yang besar yang merangkumi cendawan, karat dan jelaga. Beberapa spesies kulat basidiomiset telah digunakan secara tradisi sebagai makanan tambahan dan ubatan. Di samping khasiat nutrien yang kaya dan ciri-ciri meninggikan sistem tahan diri, basidiomiset juga merupakan sumber antibiotik semula jadi yang kaya. Metabolit-metabolit sekunder yang dirembeskan secara ekstraselular oleh sesetengah spesies basidiomiset boleh bertindak ke atas bakteria, virus dan mikroorganisma yang lain. Sesetengah daripada metabolit tersebut berkemungkinan mengandungi sebatian-sebatian bioaktif baru yang boleh dimajukan menjadi ubatan untuk kegunaan klinikal.

Potensi spesies basidiomiset yang lain untuk menghasilkan antibiotik masih belum ditentukan.

Control Laboratory for analysis of its chemical marker, bioactivity and toxicity. This powder is a standardized extract of Asam gelugor that can now be formulated into a wide range of products such as pharmaceuticals, drinks and food flavours. Nova Laboratories Sdn. Bhd., in collaboration with FRIM, is now marketing some of these products. The products have received approval from the Ministry of Health Malaysia.



Pengekstrak untuk menghasilkan ekstrak Asam gelugor
Extractor for producing Asam gelugor extracts

ANTIBACTERIAL COMPOUNDS FROM BASIDIOMYCETE FUNGI ASSOCIATED WITH PLANT DISEASES

Basidiomycetes are a large group of fungi, which includes the mushrooms, bracket fungi, rusts and smuts. Some species of basidiomycete fungi have been traditionally used as food supplements and medicine. Besides their rich nutritional value and immune enhancing properties, basidiomycetes are also a rich sources of natural antibiotics. Many secondary metabolites are secreted extracellularly by some species of basidiomycetes to combat bacteria, viruses and other microorganisms. Some of these metabolites may contain novel bioactive compounds that can be developed into clinically useful drugs.

The potentiality of bioactive compounds produced by many species of basidiomycetes has not been determined. For this reason, basidiomycete fungi associated with plant root diseases were studied for antibacterial activity by researchers at the Proteomic Centre, FRIM in a collaborative research effort with Nimura Genetics Solutions (NGS) Sdn. Bhd. The fungal isolates were obtained from FRIM Pathology Laboratory collection. A total of 112 extracts produced from fermentation culture broth of these fungal isolates, were tested for anti-bacterial activity against Staphylococcus aureus and Bacillus subtilis

Untuk tujuan ini, penyelidik-penyelidik di Pusat Proteomik, FRIM dengan usaha sama Syarikat Nimura Genetics Solutions (NGS) Sdn. Bhd., telah mengkaji kulat-kulat basidiomiest yang dikaitkan dengan penyakit akar tumbuhan untuk aktiviti antibakteria. Pencilan kulat tersebut telah diperoleh daripada koleksi Makmal Patologi FRIM. Sejumlah 112 ekstrak yang dihasilkan daripada kultur fermentasi kulat telah diuji untuk aktiviti antibakteria terhadap *Staphylococcus aureus* dan *Bacillus subtilis* dengan menggunakan 'microtiter plate assay'. Daripada sejumlah 10 ekstrak yang beraktiviti tinggi, satu ekstrak telah menunjukkan kesan yang menarik dalam 'target-directed enzyme inhibitory assay'. Ekstrak yang terpilih itu dihasilkan daripada pencilan kulat FRIM550 yang telah dipencilkan daripada akar pokok *Acacia mangium* yang berpenyakit. Sistem-sistem enzim yang spesifik dalam bakteria telah dikenal pasti sebagai sasaran yang berpotensi bagi tindakan intervensi oleh ubat-ubatan antibakteria. Oleh itu, pencilan FRIM550 mempunyai potensi untuk dikaji bagi menentukan metabolit-metabolit kulat yang aktif terhadap sasaran-sasaran enzim bakteria yang penting. Kajian lanjutan ke atas ekstrak dan fraksi-fraksi bioaktif HPLC yang dihasilkan oleh pencilan kulat tersebut sedang dijalankan.

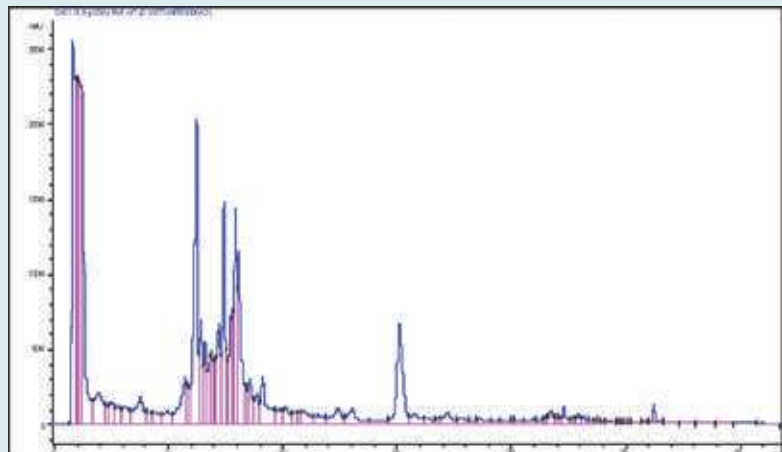


'Microtiter plate assay' dalam ujian aktiviti antibakteria daripada ekstrak kulat
Microtiter plate assay in antibacterial activity testing from fungal extracts

using microtiter plate assay. Out of 10 extracts that showed strong antibacterial activity, one exhibited interesting effects in a target-directed enzyme inhibitory assay. The extract of interest was produced by a fungal isolate, FRIM550, which was isolated from diseased roots of Acacia mangium. Specific enzyme systems of bacteria have been recognized as potential drug targets for antibacterial intervention. Therefore, isolate FRIM550 is worth studying further for potential fungal metabolites active against important bacterial enzyme targets. Further studies on the extract and bioactive HPLC fractions produced by the fungal isolate are in progress.



Kultur miselia pencilan kulat FRIM550
Mycelial culture of fungal isolate FRIM550



Kromatogram bagi fraksi HPLC ekstrak kulat
Chromatogram of HPLC fractions of fungal extracts

TRANSFORMASI GENETIK BAGI JATI YANG RINTANG TERHADAP SERANGGA

Tectona grandis atau Jati merupakan spesies balak yang bermutu tinggi serta menjadi saranan untuk program penghutan semula. Serangan serangga perosak terutamanya larva *Paliga damastesalis* terhadap tanaman pokok jati merupakan ancaman utama dalam perladangan Jati. Masalah tersebut diatasi dengan cara penyemburan racun *Bacillus thuringiensis* komersial tetapi keberkesannya amat terhad. Penghasilan pokok Jati yang rintang terhadap serangga melalui teknologi kejuruteraan genetik diharap boleh mengatasi masalah tersebut. Unit Genetik, FRIM telah menjalankan kajian pembangunan sistem transformasi untuk penambahbaikan pokok jati yang rintang terhadap serangan larva *Paliga damastesalis*.

Keputusan transformasi plasmid pCAMSBI yang membawa gen *gus* dan *cry1A(b)* melalui kaedah pembedilan ke dalam tisu jati (segmen nodal) telah berjaya dilakukan. Gen *gus* merupakan gen penanda manakala gen *cry1A(b)* gen yang dipencilkan daripada *Bacillus thuringiensis*, yang mengekodkan protein insektisidal dan bertindak dalam pengawalan serangan serangga perosak.

Analisis PCR untuk gen *gus* di peringkat *in vitro* dan *cry1A(b)* di peringkat tapak semaian telah dilakukan ke atas pokok jati transforman putatif. Fragmen bersaiz 789 bp untuk gen *gus* dan 746 bp untuk gen *cry1A(b)* telah berjaya diampifikasikan pada sebahagian pokok transforman. Keputusan penghibridan PCR-Southern telah mengesahkan identiti kedua-dua gen tersebut dan pengasaan GUS pula menunjukkan kehadiran mendakan biru di dalam tisu daun yang dikaji. Keputusan bioasai menunjukkan 32-39% permukaan daun kawalan mengalami fenomena *skeletonisation* manakala daun kimerik hanya 3-8% sahaja. Larva yang memakan daun kawalan membesar sehingga 13-18 mm manakala yang memakan daun kimerik hanya antara 5-8 mm.

GENETIC TRANSFORMATION FOR INSECT RESISTANT TEAK

Tectona grandis, locally known as Jati, produces quality timber and is recommended for reforestation. Insect attack especially *Paliga damastesalis* larvae remains the most important threat to teak plantations. The spraying of commercial *Bacillus thuringiensis* has been a common practice in addressing minor outbreaks but with limited effectiveness. It is desired that this problem be overcome by producing insect resistant teak through genetic engineering. FRIM's Genetic Unit has developed a transformation system for teak resistance to *Paliga damastesalis* larvae.

Results demonstrated the success of transformation of teak tissues (nodal segments) with pCAMSBI plasmid carrying *cry1A(b)* and *gus* genes by bombardment method. *Gus* gene is a marker gene while *cry1A(b)* gene originates from *Bacillus thuringiensis*, coding insecticidal protein and is known to enhance plant protection against insect.

PCR analysis for *gus* and *cry1A(b)* genes was carried out on the putative transformed teak. The expected fragments of 789 bp for *gus* gene and 746 bp for *cry1A(b)* gene were successfully amplified from some of the transformants. PCR-Southern hybridization confirmed the presence of these genes in the positive transformants with GUS assay exhibiting blue color in the leaf tissues. Bioassay results showed that 32-39% of the control leaf's was skeletonized whilst chimeric leaf showed only 3-8% damage. Larvae feeding on the control leaf was 13-18 mm in size, while those feeding on the chimeric leaf were only 5-8 mm.

HERBARIUM FRIM DAN TAMAN BOTANI KEPONG FRIM HERBARIUM AND THE KEPONG BOTANIC GARDENS

HERBARIUM FRIM

Di peringkat awal, herbarium FRIM bermula dengan hanya kira-kira 2,900 koleksi, iaitu 70% daripadanya merupakan spesies yang dikenali. Herbarium ini menerima sumbangan spesimen dari pelbagai herbarium di rantau ini seperti herbarium di Bangkok, Singapura dan Kew sebagai tambahan kepada koleksi yang sedia ada.

Herbarium FRIM telah berkembang dengan pesatnya. Sebelum Perang Dunia Kedua, sejumlah 39,582 koleksi dicatatkan dan ini merupakan koleksi yang penting dari pelbagai tempat di Semenanjung Malaysia, Borneo dan Asia Tenggara. Ekspedisi ke Cameron Highlands, Hutan Simpan Keledang Sayong di Kinta di Perak, Gunung Tapis di Pahang, Gunung Stong dan Gunung Sagi di Kelantan telah diadakan bagi mendapatkan spesies tumbuhan yang dapat mewakili secara menyeluruh di rantau ini. Lawatan untuk mengutip Dipterocarpaceae di Indochina dan tumbuhan lain di Brunei dan Borneo juga diadakan pada 1931 dan tahun-tahun yang berikutnya.

Selepas perang sehinggalah ke hari ini, koleksi diteruskan dan bilangan spesimen di Herbarium Kepong kini berjumlah lebih daripada 300,000 dan merupakan herbarium yang ketiga terbesar di Asia Tenggara. Pihak Herbarium FRIM turut berhubung dengan herbarium dan institusi penyelidikan lain di dunia. Hubungan serta kerjasama penyelidikan



Pengutipan tumbuhan di Tasik Kenyir
Plant collection in Tasik Kenyir

FRIM HERBARIUM

In the early years of the institution, the herbarium began as a small collection of about 2,900 items of which 70% were of known species. Contributions from the various herbaria in the region such as the herbarium in Bangkok, Singapore and Kew were received to augment the existing collection.

Over the years, the herbarium of the institute has grown substantially. Before the Second World War, a total of 39,582 acquisitions were recorded and these were from significant collections from various parts of Peninsular Malaysia, Borneo and South East Asia. Field expeditions to the Cameron Highlands, Keledang Sayong Reserve in Kinta in Perak, Gunung Tapis in Pahang, Gunung Stong and Gunung Sagi in Kelantan were made so that a comprehensive representation of the plant species in this region would be created. Collection visits of Dipterocarpaceae in Indochina and other plants in Brunei and Borneo were also made in 1931 and the following years.

After the war, and up to the present, acquisitions have continued and the number of items in the Kepong herbarium stands at more than 300,000 specimens and is currently the third largest in Southeast Asia. Significant contacts have also been made with other herbaria and research institutions the world over. Such contacts and collaborative studies have made the herbarium at FRIM an important factor in taxonomic studies of tropical plants.

In order to enhance the work of the herbarium, a new facility has begun to be constructed housing the Tropical Forest Biodiversity Centre (TFBC). The herbarium is located in the TFBC. The construction of this new complex started in October 2006 and is expected to be completed by December 2007. Located at the Jelutong Avenue in the FRIM campus, the complex comprises Blocks A and B (two and three storey, respectively) interconnected by a corridor.

menjadikan herbarium di FRIM sebagai faktor yang penting dalam kajian taksonomi tumbuhan tropika.

Bagi meningkatkan kerja-kerja di herbarium, sebuah bangunan Pusat Biodiversiti Hutan Tropika sedang dibina. Herbarium akan ditempatkan di pusat ini. Pembinaan kompleks baru ini telah bermula pada bulan Oktober 2006 dan dijangka siap pada disember 2007. Terletak di Jalan Jelutong, FRIM, kompleks ini mengandungi Blok A dan Blok B (masing-masing dua dan tiga tingkat) yang bersambung melalui sebuah koridor. Dengan keluasan 3,600 m², kompleks ini akan menempatkan unit-unit penyelidikan botani, zoologi dan pemuliharaan. Herbarium Kepong yang juga merupakan Herbarium Negara Malaysia akan ditempatkan di Blok B.



Tapak bangunan Pusat Biodiversiti Hutan Tropika
Construction site of Tropical Forest Biodiversity Centre

TAMAN BOTANI KEPONG

Taman Botani Kepong merupakan antara projek arboretum yang besar. Pada awalnya, kawasan Institut ditanam dengan pelbagai spesies tumbuhan dan ini merupakan permulaan kepada arboretum yang ada sekarang. Pada 1929, penanaman bermula dengan 12,291 anak benih diperoleh dari belukar atau di hutan sekunder serta kawasan kebun sayur yang terbiar.

Beberapa tahun selepas penubuhan FRIM arboretum Dipterokarpa dan bukan-Dipterokarpa telah ditubuhkan. Sehingga kini, terdapat tujuh tema koleksi tumbuhan hidup (arboretum) di FRIM yang mengandungi lebih 900 spesies tumbuhan asli dan eksotik yang telah didokumenkan sepenuhnya. Koleksi arboretum ini menjadikan asas yang kuat bagi penubuhan Taman Botani Kepong di FRIM.

Pada tahun 2006, pelbagai usaha telah dilakukan untuk membangunkan Taman Botani Kepong. Aktiviti infrastruktur termasuk pembangunan di pintu masuk utama, tempat letak kereta bertar serta landskap dengan pelbagai pokok palma



Mengkaji ciri-ciri morfologi sampel tumbuhan
Checking morphological characters of plant samples

With a total floor space of about 3,600 m², the complex will house the research units of botany, zoology and conservation. The Kepong Herbarium, which serves as the National Herbarium of Malaysia, will be located in Block B.

KEPONG BOTANIC GARDENS

The Kepong Botanic Gardens is part of the extensive arboretum activity at the inception of the Institute. At the beginning, the institution grounds were planted with various species of plants and this served as the beginnings of the arboretum we see today. In 1929, plantings began with 12,291 seedlings in belukar or secondary forest and abandoned vegetable gardens areas.

Within a few years after the establishment of the institute, the non-Dipterocarp and Dipterocarp arboreta were established. To date, there are now seven living collection themes (arboreta) in FRIM comprising of over 900 species of both indigenous and exotic plants in the grounds, each fully documented. This backdrop of arboreta collection now forms a strong basis for the establishment of the Kepong Botanic Gardens at FRIM.

In the year of 2006, much effort was made to develop the Kepong Botanic Gardens. Infrastructural activities included the development of the entrance, a tarmac car park and landscaping with a variety of fan-leaved palms to provide good visual impact on visitors as they first come into the gardens.

New collections and plantings including maintenance of the existing collections continued during the year. In total, 433 live collection specimens were collected and 427 species added to the gardens including some important and rare species. For the year over 300 species

berdaun bentuk kipas telah disediakan bagi mewujudkan pemandangan yang menarik kepada pelawat yang mengunjungi taman buat kali pertama.

Koleksi dan penanaman pokok-pokok baru serta penyenggaraan koleksi yang sedia ada terus dijalankan pada tahun ini. Sejumlah 433 koleksi spesimen hidup telah dikutip dan 427 spesies ditambah, termasuk beberapa spesies yang penting dan jarang ditemui. Pada tahun ini, lebih 300 spesies ditanam di taman ini. Keseluruhannya, kira-kira 437 tumbuhan telah ditanam. Satu arboretum bertema dihasilkan bagi Dipterocarpsa dengan penanaman 35 spesies.

Kerja pembinaan denai tumbuhan tingkat bawah sepanjang 400 m telah dimulakan. Di sepanjang denai ini, pelbagai jenis rotan, keladi dan halia akan ditanam. Denai yang dinamakan Denai Razak ini akan dirasmikan pada awal 2007 sebagai penghormatan kepada Dato' Dr. Abdul Razak Mohd. Ali, Ketua Pengarah FRIM yang akan bersara pada tahun 2007.

were planted in the gardens. Overall, about 437 plants were planted. A newly established theme arboretum was created for Dipterocarps with 35 species planted.

Work on the paved 400 m long under storey plant trail had started. Along the trail, a variety of palms including rattans, aroids and gingers would be planted. The trail to be named Razak Trail will be launched in early 2007 in honour of Dato' Dr. Abdul Razak Mohd. Ali, Director General of FRIM who will be retiring next year.



Tasik di tengah taman
The lake at the centre of the gardens



Pemandangan taman dari Denai Razak
View of the gardens from the Razak Trail



Pokok hiasan di atas pergola
Ornamental plants on the pergola



Denai yang berkelu menuju ke hutan di bawah teduhan sudur pokok
The trail winds into the forest under the shady canopy of trees



Taman pokok hiasan
Garden of ornamental plants



Nepenthes yang ditanam di taman
Nepenthes planted in the gardens

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

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 pemeliharaan hutan
- Peningkatan prestasi dan kecekapan kakitangan melalui program pembangunan sumber manusia yang berterusan

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*

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> | 2005 | 2006 |
|------------------------------------------------------------------------------------------------------------------------------------|--------|--------|
| Jumlah projek penyelidikan E-Science <i>Total number of E-Science projects</i> | 32 | 38 |
| Jumlah penerbitan yang dihasilkan <i>Total number of publications</i> | 665 | 662 |
| Tesis <i>Theses</i> | 9 | 16 |
| Dialog dengan industri <i>Dialogues with the industries</i> | 1 | 15 |
| Seminar dan bengkel <i>Seminars and workshops</i> | 76 | 49 |
| Bilangan kilang perusahaan kecil yang menerima faedah daripada R&D <i>Number of factories SMI's that benefited from R&D</i> | 14 | 34 |
| Bilangan kilang yang menggunakan mesin atau teknologi FRIM <i>Number of factories that used FRIM's equipment or technology</i> | 212 | 286 |
| Ladang hutan yang ditubuhkan dengan khidmat nasihat FRIM <i>Forest plantations established using FRIM's advisory services</i> | 1 | 1 |
| Kuantiti biji benih spesies hutan yang dikutip (kg) <i>Quantity of forest tree seeds collected (kg)</i> | 771 | 489 |
| Latihan teknikal yang dianjurkan <i>Number of technical training organised</i> | 26 | 74 |
| Bilangan paten <i>Number of patents</i> | 3 | 15 |
| Bilangan ujian yang dijalankan <i>Number of tests conducted</i> | | |
| Pintu rintangan api/ <i>Fire doors</i> | 11 | 19 |
| Perabot/ <i>Furniture</i> | 0 | 224 |
| Awetan kayu/ <i>Wood preservation</i> | 2920 | 1718 |
| Ujian keteguhan kayu/ <i>Plywood testing</i> | 12 | 5 |
| Kenal pasti kayu/ <i>Wood identification</i> | 1,036 | 824 |
| Ujian komposit kayu/ <i>Wood composite test</i> | 175 | 176 |
| Ujian fungi/ <i>Fungi test</i> | 5 | 7 |
| Ujian ubatan herba/ <i>Medicinal herbs test</i> | 172 | 276 |
| Ujian Pulpa dan Kertas/ <i>Pulp and paper test</i> | - | 766 |
| Khidmat perundingan/ <i>Consultancy services</i> | 16 | 25 |
| Bilangan projek penyelidikan dengan agensi luar <i>Number of research projects with external agencies</i> | 20 | 25 |
| Pameran/ <i>Exhibitions</i> | 2 | 29 |
| Jumlah pelawat ke FRIM/ <i>Total number of FRIM visitors</i> | 61,902 | 58,562 |

ANUGERAH DAN PELANTIKAN

AWARDS AND APPOINTMENTS

ANUGERAH BINTANG KEBESARAN

Pada tahun ini, Dr. Rahim Sudin (Pengarah Program Pembinaan dan Perlindungan Kayu, Bahagian Pembangunan Produk) dianugerahkan Darjah Seri Melaka (DSM) pada 8 November oleh TYT Yang di-Pertua Negeri Melaka. Sebelum itu, pada 3 Jun beliau dianugerahkan Bintang Ahli Mangku Negara (AMN) oleh Seri Paduka Baginda Yang di-Pertuan Agong.



Dr. Rahim Sudin menerima bintang DSM
Dr. Rahim Sudin receiving the DSM medal

Puan Habibah Mohamad (Penolong Pegawai Penyelidik, Program Pembinaan dan Perlindungan Kayu, Bahagian Pembangunan Produk) telah menerima Pingat Pangkuan Negara (PPN) daripada Seri Paduka Baginda Yang di-Pertuan Agong pada 3 Jun.

Sementara itu, Dr Nur Supardi Md. Noor telah menerima anugerah kebesaran Ahli Mahkota Kedah (AMK) daripada DYMM Sultan Kedah pada 26 Januari.

HONORARY AWARDS

During the year, Dr. Rahim Sudin (Director of Timber Construction and Preservation Programme, Product Development Division) was conferred Darjah Seri Melaka (DSM) on 8 November by TYT Yang di-Pertua Negeri Melaka. Earlier in the year, he was conferred Bintang Ahli Mangku Negara (AMN) on 3 June by Seri Paduka Baginda Yang di-Pertuan Agong.

Puan Habibah Mohamad (Assistant Research Officer of Timber Construction and Preservation Programme, Products Development Division) was conferred Pingat Pangkuan Negara (PPN) on 3 June by Seri Paduka Baginda Yang di-Pertuan Agong.



Puan Habibah Mohamad menerima pingat PPN
Puan Habibah Mohamad receiving the PPN medal



Dr. Nur Supardi Md. Noor menerima pingat AMK
Dr. Nur Supardi Md. Noor receiving the AMK medal

ANUGERAH SAINTIFIK

Puan Nor Hasnida Hasan (Pegawai Penyelidik dari Program Bioteknologi Hutan, Bahagian Bioteknologi) telah mendapat Anugerah Saintis Muda Negeri Selangor 2006 daripada Kerajaan Negeri Selangor dan UNISEL pada 15 November 2006.

ANUGERAH INOVASI

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

Saintis FRIM telah memenangi satu pingat emas dan lima pingat perak pada pertandingan Reka Cipta di Ekspo Teknologi Malaysia di Pusat Dagangan Dunia Putera yang diadakan dari 23 hingga 25 Februari.

Pingat emas pula dirangkul oleh reka cipta yang bertajuk "Accelerated drying system for production of eco-friendly rubberwood stock with minimum preservative requirement for furniture export market" daripada kumpulan yang diketuai oleh Dr. Tan Yu Eng dan Choo Kheng Ten.



Pingat perak untuk BEAUTE, produk pencerah kulit
Silver award for BEAUTE, a skin whitener product

Sementara itu, pingat perak pula dimenangi oleh:

- *Non structural laminated veneer lumber from oil palm trunk* daripada kumpulan yang diketuai oleh Hashim Wan Samsi dan Puad Elham.
- *Furniture components from laminated veneer oil palm.* Kumpulan ini diketuai oleh Hamid Salleh.
- *Crushed bamboo - A simpler method of producing laminated bamboo lumber.* Kumpulan diketuai oleh Dr. Wan Tarmeze Wan Ariffin dan Mohd. Tamizi Mustafa.
- *Natural antioxidant skin whitener: BEAUTE.* Kumpulan diketuai oleh Dr. Vimala Subramaniam.
- *Development of natural body weight maintenance phytonutraceutical product from Garcinia atroviridis* yang diketuai oleh Ong Boo Kean.

Dr. Nur Supardi Md. Noor also received the Ahli Mahkota Kedah (AMK) award from the DYMM Sultan Kedah on the 26 January 2006.

SCIENTIFIC AWARDS

Puan Nor Hasnida Hasan (Research Officer of Forest Biotechnology Programme, Biotechnology Division) was awarded the Young Scientist Award Selangor 2006 by the State Government of Selangor and UNISEL on 15 November 2006.

INNOVATION AWARDS

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

In the Fifth Invention Competition of Malaysian Technology Expo 2006 held at the PWTC from 23 to 25 February, FRIM scientists won one gold award and five silver awards.

Gold award was won by the invention entitled, "Accelerated drying system for production of eco-friendly rubberwood stock with minimum preservative requirement for furniture export market. The team was headed by Dr. Tan Yu Eng and Choo Kheng Ten.

Silver award winning inventions were:

- *Non-structural laminated veneer lumber from oil palm trunk". The team was headed by Hashim Wan Samsi and Puad Elham.*
- *Furniture components from laminated veneer oil palm. The team was headed by Hamid Salleh.*
- *Crushed bamboo - A simpler method of producing laminated bamboo lumber. The team was headed by Dr. Wan Tarmeze, Wan Ariffin and Mohd. Tamizi Mustafa.*
- *Natural antioxidant skin whitener: BEAUTE. The team was headed by Dr. Vimala Subramaniam.*
- *Development of natural body weight maintenance phytonutraceutical product from Garcinia atroviridis. The team was headed by Ong Boo Kean.*

Pada Pameran Antarabangsa Reka Cipta dan Inovasi Teknologi dan Reka Bentuk Industri yang ke-17 (ITEX 2006) yang diadakan di Kuala Lumpur dari 19 hingga 21 Mei pula, penyertaan FRIM telah memenangi pingat emas dan perak.

Pingat emas dimenangi oleh:

- *PASAK-064: A particle board from Tongkat Ali industrial waste.* Kumpulan diketuai oleh Dr. Mohd. Ilham Adenan.
- *Natural antioxidant skin whitening: STYN.* Kumpulan diketuai oleh Dr. Vimala Subramaniam.
- *Natural antioxidant/skin whitening standardized extracts: NEXES, GUAVYN, OSTEEN.* Kumpulan diketuai oleh Dr. Vimala Subramaniam.

Pingat perak pula diberikan kepada penyertaan yang berikut:

- *Development of herbal tea from Vitex negundo.* Kumpulan diketuai oleh En. Ong Boo Kean.
- *Natural antioxidant beverages: CARTILAC.* Kumpulan diketuai oleh Dr. Vimala Subramaniam dan Dr. Mohd. Ilham Adenan.
- *DEESREPT - Mosquito repellent essential oil.* Kumpulan diketuai oleh Dr. Nor Azah Mohamad Ali.

Di samping itu, pada Persidangan dan Pameran Antarabangsa Bio-Teknologi Asia 2006 yang diadakan dari 9 hingga 11 Ogos di Pusat Dagangan Dunia Putera, penyertaan kumpulan yang diketuai oleh Puan Nor Hasnida Hassan yang bertajuk "*Hairy root culture - the answer for sustainable production of Tongkat ali active compound*" memenangi pingat gangsa.

Pada Ekspo Penyelidikan, Reka Cipta dan Inovasi yang diadakan di Universiti Malaya dari 18 hingga 20 Julai, penyertaan yang bertajuk "*Diversity, distribution and abundance of firefly along the Kuala Selangor River*" oleh Nada, B., Kirton, L.G. dan Norma R.Y. memenangi pingat gangsa bagi kategori penyelidikan asas.

In the Seventeenth International Invention Innovation Industrial Design & Technology Exhibition 2006 (ITEX 2006), held in Kuala Lumpur from the 19 to 21 May, the following entries were awarded gold and silver medals for innovation.

Pingat Emas untuk
GUAVYN ekstrak anti-
oksidan pencerah kulit
*Gold award for
GUAVYN anti-
oxidant skin
whitening extracts*



Gold awards were presented to the following entries:

- *PASAK-064: A particle board from Tongkat Ali industrial waste. The team was headed by Dr. Mohd. Ilham Adenan.*
- *Natural antioxidant skin whitening: STYN. The team was headed by Dr. Vimala Subramaniam.*
- *Natural antioxidant/skin whitening standardized extracts: NEXES, GUAVYN, OSTEEN. The team was headed by Dr. Vimala Subramaniam.*



Pingat Perak untuk teh *Vitex negundo*
Silver award for Vitex negundo tea

Silver awards were presented to the following entries:

- *Development of herbal tea from Vitex negundo. The team was headed by Ong Boo Kean.*
- *Natural antioxidant beverages: CARTILAC. The team was headed by Dr. Vimala Subramaniam and Dr. Mohd. Ilham Adenan.*
- *DEESREPT - Mosquito repellent essential oil. The team was headed by Dr. Nor Azah Mohamad Ali.*

PENGIKTIRAFAN

Pada tahun ini, saintis-saintis FRIM terus mendapat pengiktirafan melalui pelantikan baik di peringkat tempatan mahupun antarabangsa.

Dato' Dr. Wan Razali, Wan Mohd. telah dipilih sebagai Presiden Institut Rimbawan Malaysia bagi tempoh 2006-2007. Sementara itu, bersempena dengan Ulang Tahun UPM ke-75 pada tahun 2006, Pusat Perkhidmatan Kerjaya dan Alumni UPM telah menerbitkan sebuah buku yang bertajuk "75 Jewels of UPM". Buku ini mengandungi profil 75 Ahli Kehormat Alumni. Dato' Dr. Wan Razali merupakan salah seorang ahli yang disebut di dalam buku tersebut.

Dr. Nur Supardi Mohd. Noor dan Dr. Ismariah Ahmad pula dilantik sebagai salah seorang editor bagi *Malaysian Forester*, sebuah jurnal yang diterbitkan oleh Jabatan Perhutanan Semenanjung Malaysia.

Di peringkat antarabangsa pula, Dr. Lee Su See dilantik sebagai *Associate Editor of Mycoscience*, iaitu sebuah jurnal antarabangsa yang dikeluarkan oleh *Mycological Society of Japan* diterbitkan oleh Springer-Verlag, Tokyo, Japan.

Dr. Chan Hung Tuck dilantik sebagai *Editorial Board Member of Ecological Research*, sebuah jurnal antarabangsa yang dikeluarkan oleh *Ecological Society of Japan* dan diterbitkan oleh Springer-Verlag, Tokyo, Japan.

Dr. Saw Leng Guan dilantik sebagai *Member of the Science Audit of Royal Botanic Gardens (RBG)*, Kew, UK in May 2006 yang mengaudit program penyelidikan RBG.

In the International Bio-Technology Asia Conference and Exhibition 2006, held on the 9 to 11 August at the PWTC, the entry entitled "Hairy root culture – the answer for sustainable production of Tongkat ali active compound" won a bronze medal for innovation. The team was headed by Nor Hasnida Hassan.

In the Ekspo Penyelidikan, Rekacipta dan Inovasi event held at the Universiti Malaya on the 18 to 20 July, the entry entitled "Diversity, distribution and abundance of firefly along the Kuala Selangor River submitted by Nada, B., Kirton, L.G. and Norma R.Y. won the bronze medal for the category of fundamental research.

RECOGNITION

During the year, several of FRIM officers gained recognition through international and national appointments.

Dato' Dr. Wan Razali, Wan Mohd. was elected President of the Institute of Foresters Malaysia for the period 2006-2007. In conjunction with UPM's 75th Anniversary, its Centre for Career and Alumni Services published a book entitled, "75 Jewels of UPM" on the profiles of 75 Distinguished Alumni Members. Dato' Dr. Wan Razali was one of them featured in the book.

Dr. Nur Supardi Mohd. Noor and Dr. Ismariah Ahmad have been appointed as editors for the Malaysian Forester, a journal published by the Forestry Department of Peninsular Malaysia.

Dr. Lee Su See was appointed Associate Editor of Mycoscience, an international journal produced by the Mycological Society of Japan and published by Springer-Verlag, Tokyo, Japan.

Dr. Chan Hung Tuck was appointed Editorial Board Member of Ecological Research, an international journal produced by the Ecological Society of Japan and published by Springer-Verlag, Tokyo, Japan.

Dr. Saw Leng Guan was appointed Member of the Science Audit to the Royal Botanic Gardens (RBG), Kew, UK in May 2006 which audits the research programme of the RBG.

PENGGOMERSIALAN

Akreditasi ISO

Sehingga kini 15 buah makmal telah berjaya mendapat akreditasi ISO 9001-2000. Makmal Ujian Perabot, Makmal Laminasi Kayu, Makmal Kemasan Kayu dan Makmal Anatomi Kayu juga dalam proses untuk mendapatkan akreditasi ISO 17025.

COMMERCIALISATION

ISO Accreditation

To date a total of 15 laboratories have been accredited under ISO 9001-2000. The Furniture Testing, Wood Lamination, Wood Finishing and Wood Anatomy Laboratories were also in the process of obtaining the ISO 17025 accreditation.

| No | Makmal <i>Laboratory</i> |
|-----|--------------------------------|
| 1. | Makmal Analisis Awetan Kayu |
| 2. | Makmal Pengujian Kertas |
| 3. | Makmal Perlindungan Api |
| 4. | Makmal Pengujian Komposit Kayu |
| 5. | Makmal Pengeringan Kayu |
| 6. | Makmal Kejuruteraan Kayu |
| 7. | Makmal Entomologi Kayu |
| 8. | Makmal Mikologi Kayu |
| 9. | Makmal Ujian Perabot |
| 10. | Makmal Anatomi Kayu |
| 11. | Makmal Kemasiapan Kayu |
| 12. | Makmal Laminasi Kayu |
| 13. | Makmal Kimia Tanah |
| 14. | Makmal Genetik |
| 15. | Makmal Teknologi Biji Benih |

Memorandum Persefahaman

Pada 2006, FRIM telah menandatangani tujuh perjanjian persefahaman (MOU) dengan institusi penyelidikan dalam dan luar negara serta agensi-agensi kerajaan, termasuklah Forestry and Forest Products Research Institute, Tsukuba, Japan; Royal Botanic Gardens, Kew, U.K., PT Mutu Agung Lestari, Bogor, Indonesia; Kolej Universiti Kejuruteraan Utara Malaysia (KUKUM), Arau, Perlis; Cooperation Internationale en Recherche Agronomique pour le Development (CIRAD); Kementerian Pembangunan Usahawan dan Koperasi; dan Majlis Perbandaran Taiping.

Memorandum of Understanding

In 2006, a total of seven MOUs were signed with various national and international research institutes and government agencies. They included Forestry and Forest Products Research Institute, Tsukuba, Japan; Royal Botanic Gardens, Kew, U.K., PT Mutu Agung Lestari, Bogor, Indonesia; Kolej Universiti Kejuruteraan Utara Malaysia (KUKUM), Arau, Perlis; Cooperation Internationale en Recherche Agronomique pour le Development (CIRAD); Kementerian Pembangunan Usahawan dan Koperasi; and Majlis Perbandaran Taiping.

PEMINDAHAN TEKNOLOGI TECHNOLOGY TRANSFER

Pada tahun ini, FRIM terus menumpukan usaha dalam bidang pemindahan teknologi. Selaras dengan objektif institut, maklumat tentang pengurusan dan pembangunan perhutanan, hasil hutan dan penggunaannya disebarikan 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 *Exhibition*

- Malaysian Technology Exhibition (MTE) 2006. PWTC, Kuala Lumpur, 23 to 25 February, FRIM
- Seventeenth International Invention Innovation Industrial Design and Technology. PWTC, Kuala Lumpur, 19 to 21 May, FRIM
- Herbal Asia 2006. Kuala Lumpur, 21 to 24 May, FRIM
- Conference and exhibition on Women's Health & Asean Traditional Medicine (WHAT MEDICINE) 2006. PWTC, Kuala Lumpur, 28 to 30 July, FRIM
- Third Asia Pacific Natural Products Expo (NATPRO). PWTC, Kuala Lumpur, 17 to 19 August, FRIM
- Malaysia Agriculture, Horticulture and Agrotourism Show. Serdang, Selangor, 21 to 26 November, MARDI, FRIM

Kursus Latihan *Training Course*

- Kursus Program Pengenalan Kepada Perhutanan untuk Kakitangan Lantikan Baru, FRIM, 20 to 21 February, FRIM, Kepong
- Kursus Landskap. FRIM, Kepong, 20 to 22 February, FRIM, Majlis Perbandaran Pulau Pinang
- Flora Writing Course I. FRIM, Kepong, 27 February to 3 March, FRIM
- Kursus Landskap dan Penyelenggaraan Pokok. FRIM, Kepong, 20 to 24 March, FRIM
- Field Collection and Herbarium Techniques Course. Ulu Gombak, Selangor, 21 March, FRIM
- Field Collection and Herbarium Techniques Course. Gunung Ulu Kali, Genting Highlands, Pahang, 22 March, FRIM
- Field Collection and Herbarium Techniques Course. Tanjung Tuan, Melaka, 28 March, FRIM
- Field Collection and Herbarium Techniques Course. Krau Wildlife Reserve, Pahang, 29 March, FRIM
- Kursus Asas Keselamatan. 4 to 5 April, FRIM
- Kursus landskap. FRIM, Kepong, 3 to 7 April, FRIM, PERHEBAT
- Tree Identification Course. FRIM, Kepong, 17 to 27 April, FRIM
- Kursus Landskap (FRIM-Jabatan Lanskap Negara). FRIM, Kepong, 25 to 27 April, FRIM
- How to use the IUCN Red List Categories & Criteria 2001. FRIM, Kepong, 26 April, FRIM
- Kursus "Handling of MS Visio & MS Word in preparation of working flow chart for file meja". FRIM, Kepong, 26 April, FRIM
- Field Collection and Herbarium Techniques Course. Bukit Anak Takun and Tempplers Park, Selangor, 27 April, FRIM
- Kursus Landskap. Kuala Lumpur, 7 to 11 May, FRIM, Kementerian Luar Bandar
- Kursus Teknologi Herba. Kuala Lumpur, 8 to 12 May, FRIM, Kementerian Kemajuan Luar Bandar dan Wilayah (KKLW)
- Kursus "volumetric flask". FRIM, Kepong, 23 May, FRIM
- Kursus "pengendalian conditioning chamber / humidity chamber". FRIM, Kepong, 26 May, FRIM
- Kursus Tapak Semaian (2006). FRIM, Kepong, 13 to 15 June, FRIM
- Arborist Certification Program- First Roadshow. Ipoh, 15 June, FRIM
- Kem Penyelidikan Sains 2006. 3 to 8 July, Kepong, FRIM and Kementerian Pelajaran Malaysia
- Flora Writing Course II. FRIM, Kepong, 18 to 21 July, FRIM
- Kursus Pengenalan Pokok dan Tumbuhan Hutan Untuk Jabatan Perhutanan dan Agensi Lain yang Berkaitan. 21 ke 24 Ogos, Kepong, Pusat Latihan Kepong, FRIM
- Kursus Tapak Semaian. FRIM, Kepong, 6 to 8 August, FRIM
- Kursus Sains Tanah 2006. FRIM, Kepong, 8 to 10 August, FRIM
- Kursus Pengenalan Pokok dan Tumbuhan Ubatan. 23 August, Kepong, Unit Latihan Perhutanan (ULP), FRIM
- Kursus Landskap dan Penyelenggaraan Pokok. FRIM, Kepong, 18 to 22 September, FRIM
- Course on Pulp and Paper Technology. 11 to 14 September, Kepong, FRIM
- Grass Identification Course. FRIM, Kepong, 19 to 21 September, FRIM
- Kursus Pengendalian GOE. FRIM, Kepong, 4 October, FRIM.
- Kursus Pembalakan Berimpak Rendah (RIL) Hutan Paya Gambut. Kuantan, Pahang, 8 to 9 November, FRIM, GEF/UNDP, Jabatan Perhutanan Negeri Pahang (JPNP)
- Bengkel penanaman bakau di pesisiran pantai terhakis. SPL Mata Ayer, Perlis, 24 to 25 November, FRIM
- Sesi Taklimat dan Penyerahan Sampel Program Peningkatan Kualiti Produk Herba. FRIM, Kepong, 7 December, FRIM
- Understanding of ISO 9001: 2000. FRIM, Kepong, 13 December, FRIM.

Seminar, Bengkel, Persidangan dan Simposium
Seminar, Workshop, Conference and Symposium

- Seminar on Bridging the Gap between R&D Findings and Policy Makers in Forest Management Planning. 23 February, Kuala Lumpur, FRIM, UPM and DANIDA
- Workshop on the Trade Dynamics of Agarwood in Malaysia. 1 to 2 March, FRIM, Kepong, TRAFFIC (Southeast Asia), FRIM
- Bengkel Penilaian Pendidikan Alam Sekitar bersama Guru Sekolah Rendah. FRIM, Kepong, 25 March, FRIM
- Seminar on Peat Swamp Forest Fire. 8 May, Kepong, FRIM
- Bengkel Penghasilan Kertas Buatan Tangan (Handmade Paper). 16 to 17 May, FRIM, Kepong, FRIM
- Seminar on Forest Fire in Peat Swamp Forests. Kuala Lumpur, 23 May, FRIM
- Urban Forestry Conference: Managing Urban Green for Sustainable Cities. 6 to 8 June, Crown Princess Hotel, Kuala Lumpur
- Urban Forestry Conference: Managing Urban Green for Sustainable Cities. Kuala Lumpur, 6 to 8 June, FRIM
- Seminar and Fibre Tester Demonstration, 14 June 2006. FRIM, Kepong.
- FRIM's Non-IRPA Projects. Project Evaluation Meeting. 4 to 7 July, Kepong, FRIM
- National Workshop on the Long-term Ecological Research. 11 to 12 July, Kepong, FRIM
- Seminar on Energy from Biomass 2006: Conversion of Bio-Resources into Energy and Other Applications. FRIM, Kepong, 25 to 26 July, FRIM
- Conference and Exhibition on Women's Health & ASEAN Traditional Medicine (WHAT MEDICINE) 2006. PWTC, Kuala Lumpur, 28 to 30 July, FRIM, JTMP
- International Agro-forestry Conference 2006: Harnessing the benefit. Kuala Lumpur, 1 to 2 August, FRIM
- International Biotechnology Conference & Exhibition. PWTC, Kuala Lumpur, 9 to 11 August, FRIM, MOSTI Fern Workshop. FRIM, Kepong, 17 August, FRIM
- BRAHMS Workshop. FRIM, Kepong, 21 to 25 August, FRIM
- Workshop on Timber Application to Complement Modular Coordination (MC) and Industrialised Building System (IBS). 23 August, FRIM, Kepong
- Seminar on Community Involvement in Sustainable Bio-resource and Biotechnology. Sabah, 4 to 7 September, FRIM, IDS
- Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health - Past, Present and Future. 12 to 13 September, Kepong, FRIM
- Fourth National Seminar on Wood-based Panel Products: Towards meeting Global Challenges. 28 to 30 September 2004, Kuala Lumpur. FRIM
- Eighth Pacific Rim Bio-Based Composites Symposium: Advances and Challenges in Biocomposites. 20 to 23 November, Kuala Lumpur, FRIM
- Herbal Asia 2006. Kuala Lumpur, 21 to 24 November, FRIM, GITEX
- Bengkel Penilaian Pendidikan Alam Sekitar bersama Guru Sekolah Menengah. FRIM, Kepong, 22 November, FRIM
- Seminar Hutan Pesisiran Pantai Negara : Peranan Agensi Kerajaan dan Masyarakat Tempatan. Kuala Perlis, Perlis, 23 November, FRIM, JPSM, Wetlands International
- Biotechnology Symposium III (2006). Sabah, 29 November to 1 December, FRIM, UMS
- National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
- BioMalaysia 2006. KLCC, Kuala Lumpur, 6 to 8 December, FRIM, Malaysian Biotech Corporation
- Cryopreservation Workshop in conjunction with the National Seminar and Workshop on Forest Biotechnology 2006, FRIM, Kepong, 6 December, FRIM
- Workshop on Protein Analysis using MALDI-TOF MS. FRIM, Kepong, 6 to 7 December, FRIM
- Workshop on Sample Separation and Fractionation using Sepbox 2D-250. FRIM, Kepong, 6 to 7 December, FRIM
- Workshop on Tree and Herb Improvement. 6 to 8 December, Kepong, FRIM
- Highlights of FRIM's IRPA projects 2005. Identifying potential commercial collaborations. 14 to 15 December, Genting Highlands, Pahang, FRIM
- Workshop on Proficiency Testing Programme for CCA Wood Preservative and Treated Wood. FRIM, Kepong, 18 December, FRIM
- Workshop on the Application of Remote Sensing & GIS in Tropical Forest Management and Biological diversity. Kuala Lumpur, 21 to 22 December, FRIM



Dr. Shamsudin Ibrahim menyampaikan kata alu-aluan di *National Workshop on Long-term Ecological Research*
Dr. Shamsudin Ibrahim addressing the National Workshop on Long-term Ecological Research



Peserta Kursus Pembebasan Formaldehid, FRIM
Participants of the Course on Formaldehyde Release, FRIM



Peserta Kursus Tapak Semaian, FRIM
Participants of the Nursery Course, FRIM

KHIDMAT PERUNDINGAN

CONSULTANCY SERVICES

Pada 2006, FRIM mengendalikan sebanyak 25 perundingan yang bernilai RM 424,860. Daripada perundingan ini, FRIM menerima sebanyak RM 169,944 sebagai bayaran pengurusan dan pentadbiran.

In 2006, FRIM conducted 25 consultancies worth RM 424,860. From these consultancies, RM 169,944 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> |
|------------------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------------|
| Membangunkan secara bersama (FRIM / MARDI) Pakej seminar dan pemindahan technology) | Zahari Othman | MARDI |
| Menjalankan ujian keberkesanan produk "wood plastic composites" terhadap serangan anai-anai. | Roszaini Kadir | Tanjung Manis Holding Industries Sdn. Bhd. |
| Second surveillance of the Johor FMU | Samsuddin Musa | Malaysian Timber Council |
| Penyelenggaraan Sistem (eSPG -SSM) di Mardi | Zahari Othman | MARDI |
| To investigate the timber species used for the support of water tank and timber roof structure | Lim Seng Choon | Bina Goodyear Bhd. |
| Penilaian anggaran kerugian akibat pembalakan haram di Bukit Unggul Eco-Media City. | Dr. Rahman Kassim | Knight Frank, Ooi and Zahari Sdn. Bhd. |
| Assessment of Pahang FMU against MC&I 2002 | Lim Seng Choon | SGS (Malaysia) Sdn. Bhd. |
| Pilot scale production of medium density fiberboard MDF from oil palm empty fruit bunches | Dr. Koh Mok Poh | Soon Seng Palm Product Sdn. Bhd. |
| To investigate the type of timber used for boardwalk in Pulau Rebak, Kedah | Lim Seng Choon | Rebak Island Marina Bhd. |
| Proposed Land Reclamation for Integrated resort development | Dr. Chan Hung Tuck | Asia Pacific Environmental Consultants Sdn. Bhd. |
| Menentukan kesihatan pokok-pokok di sekitar kawasan Datai | Dr. Elizabeth Philip | Mr. Jamie Case |
| Penilaian hasil sebenar Hutan Simpan Bukit Tarik, Selangor Darul Ehsan | Dr. Ismariah Ahmad | Koperasi Serbaguna Anak-anak Selangor (KOSAS) |
| Membangun dan mengubah suai modul loan interface (eSPG) | Zahari Othman | MARDI |
| Menjalankan ujian keberkesanan "Thermowood D terdapat anai anai | Roszaini Kadir | APP Timber Sdn. Bhd |
| Cultivation techniques of aromatic species on tin tailings | Dr. Ang Lai Hoe | Maju Aik Sdn. Bhd |

| | | |
|------------------------------------------------------------------------|-------------------|--------------------------------------------------|
| Assessment of Perak State Forestry Dept. on MC& I (2002) | Dr. Lim Hin Fui | SIRIM QAS Int. Sdn. Bhd. |
| Flora and Fauna Survey | Dr. Saw Leng Guan | Asia Pacific Environmental Consultants Sdn. Bhd. |
| Ujian keberkesanan sample papan lapis dan kayu atas serangan anai anai | Roszaini Kadir | BARAMAS Sdn. Bhd |
| Service for tree planting in 29 acre project site of Paya Indah | Dr. Ang Lai Hoe | Gema Padu Sdn. Bhd. |
| Evaluation of fire retardants | Zaihan Jalaludin | Industrial Pyrotech Sdn. Bhd. |
| Perkhidmatan penyelenggaraan Sistem Pengurusan Gaji | Zahari Othman | Lembaga Koko |
| Permasalahan berkaitan anai anai dan serangga perosak | Roszaini Kadir | Muhibbah Airline support industries Sdn. Bhd. |
| Assessment of Selangor FMN | Dr. Lim Hin Fui | SGS Malaysia Sdn Bhd. |
| Establishment and Institutional restructuring of FRIM since 1986 | Dr. Norini Haron | FAO Regional Office |
| Perkhidmatan Penyelenggaraan Pengurusan Gaji untuk MARDI | Zahari Othman | MARDI |

PERJAWATAN ESTABLISHMENT

PELANTIKAN

Pada 2006, FRIM telah melantik seramai 15 orang Pegawai Penyelidik di bawah Kumpulan Pengurusan dan Profesional serta Penolong Pegawai Penyelidik di bawah Kumpulan Sokongan 1. Dua orang dilantik ke Q53, masing-masing seorang dilantik di bawah kategori Q41, W41 dan L41. Sepuluh orang Penolong Pegawai Penyelidik pula dilantik di bawah kategori Q27.

APPOINTMENTS

In 2006, a total of 15 new Research Officers and Assistant Research Officers under the Management and Professional Category, were appointed. Two Officers were appointed to Q53, and one each for the categories Q41, W41 and L41. Ten Assistant Research officers were appointed to Q27.

| Pegawai Officers | |
|----------------------------|--------------------------------------|
| Dr. Kodi Isparan Kandasamy | Pegawai Penyelidik Gred Q53 |
| Dr. Pan Khang Aun | Pegawai Penyelidik Gred Q53 |
| Dr. Jaya Vejayan Palliah | Pegawai Penyelidik Gred Q41 |
| Ilyani Mazlan | Pegawai Juruaudit Gred W41 |
| Nor Azura Ahmad Murad | Pegawai Undang-Undang Gred L41 |
| Sadali Sahat | Penolong Pegawai Penyelidik Gred Q27 |
| Kamarudin Saleh | Penolong Pegawai Penyelidik Gred Q27 |
| Mazurah Mohamed Isa | Penolong Pegawai Penyelidik Gred Q27 |
| Abd. Majid Jalil | Penolong Pegawai Penyelidik Gred Q27 |
| Noor Nazreen Nasir | Penolong Pegawai Penyelidik Gred Q27 |
| Harfendy Osman | Penolong Pegawai Penyelidik Gred Q27 |
| Haminuddin Hassan | Penolong Pegawai Penyelidik Gred Q27 |
| Suharti Samod | Penolong Pegawai Penyelidik Gred Q27 |
| Noraidah Subakin | Penolong Pegawai Penyelidik Gred Q27 |
| Sharmizi Ismail | Penolong Pegawai Penyelidik Gred Q27 |

KENAIKAN PANGKAT PROMOTIONS

Seramai 107 orang kakitangan FRIM telah dinaikkan pangkat pada tahun 2006. Mereka termasuklah:
A total of 107 FRIM staff were promoted in 2006. The details are as follows:

| Kakitangan Staff | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Q54 Ke VU7 Dr. Shamsudin Ibrahim</p> <p>Q54 Ke VK7 Dr. Chan Hung Tuck, KMN Wan Rahmah Wan A. Raof Dr. Lee Su See Dr. Mohd. Nor Mohd. Yusoff KMN</p> <p>Q48 Ke Q52 Dr. Ani Sulaiman Norhara Hussein Dr. Hashim Md. Nor Dr. Wan Rashidah Wan Ab. Kadir Salamah Selamat Abd. Razak Othman Dr. Khalil Aziz Hamzah Dr. Ahmad Zuhaidi Yahya Dr. Lillian Chua Swee Lian Dr. Norwati Mohammad Dr. Elizabeth Phillip Dr. Koh Mok Poh Dr. Abdul Rahman Kassim Dr. Laurence G. Kirton Ismail Harun Dr. Ahmad Fauzi Puasa Samsudin Musa Azman Hassan Lim Seng Choon, PPN, AMP Adnan Mohammad Dr. Ismariah Hj. Ahmad Dr. Mohamad Omar Mohamad Khaidzir Nor Azman Hussein Dr. Wan Asma Ibrahim Norhayati Nordin Mohd. Arshad Saru Dr. Mohd. Ilham Adenan Dr. Salmiah Ujang Mohd. Noor Mahat Dr. Nur Supardi Md. Noor Dr. Richard Chung Cheng Kong Dr. Lee Soon Leong Dr. Nor Azah Mohd. Ali</p> <p>Q3 Ke Q48 Norsiha Ayop Vimala P. Subramaniam Dr. Ling Sui Kiong</p> | <p>Nor Hasnida Hassan Siti Aisah Shamsuddin Abdul Hamid Salleh Norsham Suhaina Yaakob Zaridah Mohd Zaki Nurhanan Murni Yunos Lok Eng Hai Dr. Fadillah Zainuddin Ong Boo Kean Haliza Ismail Safiah @ Yusmah Muhammad Yusoff Ahmad Fauzi Mohd. Shariff Mastura Buang Shaharuddin Hashim Puad Ilham Nur Hajar Zamah Shari Boon Kok San Sam Yen Yen Mohd. Parid Mamat Rafeadah Rusli Dr. Serifina Christine Fletcher Mohd. Ghazali Hasan Dr. Kevin Ng Kit Siong Siti Salwana Hashim Dr. Nik Musaadah Mustapha</p> <p>Q32 Ke Q36 Habibah Mohamad Mohd. Afendi Husin Nor Azian Mohd. Kasby</p> <p>Q27 Ke Q32 Abdull Rashih Ahmad Ang Khoon Cheng Ruziah Ripin</p> <p>Q22 Ke Q26 Muhammad Deraman Jalali Salleh Sharifah Maulana</p> <p>Q17 Ke Q22 M. Markandan Saripah Barom Saimas Ariffin Normah Basir Mohd. Hasan Buang</p> <p>N22 Ke N26 Rohimah Abdullah</p> <p>W22 Ke W26 Musni Abdul Mois</p> |

| | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Q41 Ke Q44 Hashim W. Samsi Asiah Osman Dr. Hamdan Hussain Lee Chai Ting Ahmad Azaruddin Mohd. Nor Zaihan Jalaludin Dr. Norwati Adnan Ismail Parlan Nashatul Zaimah Noor Azman Norlia Basherudin Zainon Abu Samah Roszaini Kadir Suffian Misran Rosdi Koter Mohd. Zaki Abdullah Sharmiza Adnan Wan Mohd. Shukri Wan Ahmad Sarifah Kunju Ahmad Muhd Nazak @ Mohd Nasir Husin | R9 Ke R14 Mohammad Kamaruzaman Nawawi G11 Ke G14 Ahmad Awang N11 Ke N14 Nor Azni Jaafar N1 Ke N4 Sahrol Ablah R3 Ke R6 Abdul Wahid Mohamad Mohd. Hanafiah Ahmad |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

PENERIMA ANJAKAN GAJI **PAY INCREMENT AWARDEES**

Seramai enam orang Pegawai Penyelidik dan 23 orang kakitangan Kumpulan Sokongan menerima anugerah anjakan gaji pada tahun 2006.

During the year, six Research Officers and 23 staff from the Supporting Group received pay increments.

| Kakitangan <i>Staff</i> | |
|--------------------------------------------|----------------------|
| Kumpulan Pengurusan dan Profesional | |
| Dr. Marzalina Hj. Mansor | |
| Dr. Rasadah Mat Ali | |
| Mohd. Zamshari Abdul Rahman | |
| Dr. Norini Haron | |
| Dr. Mohamad Omar Mohd. Khaidzir | |
| Abdul Hamid Saleh | |
| Kumpulan Sokongan | |
| Siti Rafidah Mahmud | Wan Zamani Wan Yusof |
| Maimunah Tompong | Zanariah Nassarudin |
| Salmah Abd. Karim | Siti Roshidan Saidin |
| Nazly Jamaluddin | Zawiah Ngah |
| Mohd. Faridz Zoll Patah | Ab. Lah Mohd. Nor |
| A. Roslee Radzalli | Rusli Mahidin |
| Zainal Abidin Mansor | Hamdan Sohor |
| Shahar Wagio | Parthiban Marimuthu |
| Jefery Zainudin | Vasuthevan Narayana |
| Yahaya Hamid | Zulkifli Md. Said |
| Mohamad Alhad Salleh | Roslan Abdul |
| Zamrudah Musa | |

PELETAKAN JAWATAN RESIGNATION

Pada 2006, empat orang Pegawai Penyelidik dan empat orang kakitangan Kumpulan Sokongan FRIM telah meletak jawatan.

In 2006, four Research Officers and four staff of the Supporting Group resigned from the Institute.

| Kakitangan <i>Staff</i> | Tarikh peletakan jawatan <i>Date of resignation</i> |
|----------------------------|--------------------------------------------------------|
| Raja Saadiah Raja Shariff | 12 January |
| Zamziyati Hamid | 1 May |
| Abdullah Abd. Rahman Shah | 1 May |
| Khairulnisam Harun | 1 May |
| Maria Zura Mohd. Zain | 25 July |
| Zuriana Harun | 1 September |
| Norul Hisham Hamid | 1 February |
| Faizatul Shima Mohd. Yunus | 3 April |

Dr. Baskaran Krishnapillay menerima cenderahati daripada Ketua Pengarah
Dr. Baskaran Krishnapillay receiving a gift of appreciation from the Director General



PERSARAAN RETIREMENT

Empat Pegawai Penyelidik dan sembilan kakitangan Kumpulan Sokongan bersara pada 2006.
Four Research Officers and nine staff of the Supporting Group retired in 2006.

| Persaraan <i>Retirement</i> | Tarikh <i>Date</i> |
|---------------------------------------------------------------|-----------------------|
| Persaraan wajib <i>Mandatory retirement</i> | |
| Mohd. Shukari Midon | 4 January |
| Abdul Halim Hj. Jawi | 13 March |
| Sulaiman Mohd. Zahari | 17 March |
| Ali Johar | 25 March |
| Dr. Baskaran Krishnapillay | 28 March |
| Md. Salleh Alias | 5 May |
| Yong Fook Onn | 11 May |
| Sellamah Ponnampalan | 23 October |
| Mustaffa Mahmood | 10 November |
| Persaraan pilihan <i>Optional retirement</i> | |
| Zainab Salim | 1 January |
| Ahmad Che Abd. Salam | 1 March |
| Mohd. Saad Mat Som | 1 June |
| Mohd. Yunus Hitam | 1 September |

LATIHAN TRAINING

LATIHAN AKADEMIK

Pada tahun ini sembilan orang pegawai berjaya menamatkan pengajian masing-masing dari universiti tempatan dan luar negeri. Ijazah yang diperoleh termasuklah lima ijazah kedoktoran dan empat ijazah sarjana. Bidang pengajian ialah Teknologi Gentian, Farmasi, Bioteknologi, Biologi, Botani, Zoologi, Pembangunan Sumber Manusia, Perpustakaan & Maklumat, Ekologi Perbandaran dan Kejuruteraan Kimia. Sementara itu lima orang pegawai mendaftar untuk pengajian lepasan ijazah dalam tahun 2006.

ACADEMIC TRAINING

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. The areas of study were in Fibre Technology, Pharmacy, Biotechnology, Biology, Botany, Zoology, Human Resource Development, Library & Information, Urban Ecology and Chemical Engineering. Meanwhile, a total of five officers registered for post-graduate studies in 2006.

PEGAWAI YANG TAMAT PENGAJIAN OFFICERS WHO HAVE COMPLETED THEIR STUDIES

| Nama <i>Name</i> | Ijazah <i>Degree</i> | Bidang <i>Field</i> | Universiti <i>University</i> |
|------------------------------|-------------------------|----------------------------|---------------------------------|
| Dr. Wan Asma Ibrahim | Ph.D. | Fibre Technology | UPM |
| Dr. Nik Musaadah Nik Mustapa | Ph.D. | Pharmacy | King's College U.K |
| Dr. Fadhilah Zainuddin | Ph.D. | Biotechnology | University of Birmingham |
| Dr. Christine Dawn Fletcher | Ph.D. | Zoology | UKM |
| Dr. Getha Krishnasamy | Ph.D. | Biotechnology | UM |
| Wan Rahmah Wan A. Raof | M.Sc. | Human Resource Development | UPM |
| Mastura Buang | M.Sc. | Library & Information | UIA |
| Ahmad Nazarudin Mohd. Roseli | M.Sc. | Urban Ecology | UPM |
| Sharmiza Adnan | M.Sc. | Chemical Engineering | UKM |

PEGAWAI YANG MENDAFTAR UNTUK PENGAJIAN LEPASAN IJAZAH OFFICERS REGISTERED FOR POST-GRADUATE STUDIES

| Latihan Akademik <i>Academic Training</i> | Luar Negeri <i>Overseas</i> | | Dalam Negeri <i>Local</i> | | Jumlah <i>Total</i> | |
|----------------------------------------------|--------------------------------|------|------------------------------|------|------------------------|------|
| | 2005 | 2006 | 2005 | 2006 | 2005 | 2006 |
| Ph.D. | 1 | 1 | 2 | 3 | 3 | 4 |
| M.Sc. | - | - | 7 | 1 | 7 | 1 |
| B.Sc. | - | - | - | - | - | - |
| Jumlah <i>Total</i> | 1 | 1 | 9 | 4 | 10 | 5 |

LATIHAN BUKAN AKADEMIK

Pada tahun 2006, lebih ramai pegawai FRIM telah mengikuti latihan di dalam dan di luar negara. Sementara bilangan pegawai FRIM yang hadir di persidangan di dalam dan di luar negara berkurangan.

NON-ACADEMIC TRAINING

In 2006, FRIM registered a tremendous increase in staff attending training courses locally and internationally while there was a decrease of FRIM staff attending conferences both locally and overseas.

| Latihan Bukan Akademik <i>Non Academic Training</i> | Pengurusan & Profesional <i>Management & Professional</i> | | Kumpulan Sokongan <i>Supporting Group</i> | | Jumlah Total | |
|--------------------------------------------------------|------------------------------------------------------------------|------------|----------------------------------------------|------------|--------------|-------------|
| | 2005 | 2006 | 2005 | 2006 | 2005 | 2006 |
| Kursus <i>Course</i> | | | | | | |
| Luar Negeri <i>Overseas</i> | 9 | 17 | 1 | 2 | 10 | 19 |
| Tempatan <i>Local</i> | 34 | 387 | 31 | 592 | 65 | 979 |
| Persidangan <i>Conferences</i> | | | | | | |
| Luar Negeri <i>Overseas</i> | 102 | 88 | 1 | 1 | 103 | 89 |
| Tempatan <i>Local</i> | 187 | 150 | 25 | 17 | 212 | 167 |
| Jumlah Total | 332 | 642 | 58 | 612 | 390 | 1254 |

HARI ANUGERAH DAN ULANG TAHUN KE-21 FRIM FRIM'S AWARDS DAY AND 21ST ANNIVERSARY

FRIM telah menganjurkan Hari Anugerah dan Ulang Tahun Ke-21 di Dewan Perdana FELDA, Jalan Semarak, Kuala Lumpur pada 16 November 2006. Majlis dirasmikan oleh Y. Bhg. Dato' Suboh Mohd. Yassin, Ketua Setiausaha Kementerian Sumber Asli dan Alam Sekitar. Kemuncak majlis ialah penganugerahan dua anugerah yang baru diperkenalkan iaitu Anugerah MFRDB dan Anugerah Ketua Pengarah FRIM. Anugerah khidmat cemerlang (individu dan kumpulan), anugerah khidmat setia, anugerah penerbitan terbaik, anugerah khidmat masyarakat, anugerah penyelidikan terbaik, anugerah saintis terbaik dan sukan turut disampaikan.



Ucapan perasmian oleh Y. Bhg. Dato' Suboh Mohd. Yassin, Ketua Setiausaha NRE

Opening address by Y. Bhg. Dato' Suboh Mohd. Yassin, Secretary General of NRE

ANUGERAH MFRDB

Anugerah MFRDB merupakan anugerah yang tertinggi diberikan kepada individu yang menunjukkan kualiti kepimpinan yang unggul dan berkesan. Individu ini telah memainkan peranan positif ke arah pencapaian pasukan kerjanya menerusi sumbangan yang bermutu tinggi dan menunjukkan disiplin diri yang wajar dicontohi. Penilaian ke atas kepimpinan bukan sahaja berdasarkan skop tugas rasmi malah merangkumi tanggungjawab sosial dan hubungan kemasyarakatan penerima anugerah. Penerima anugerah ini ialah Y. Bhg. Dato' Dr. Hj. Abdul Razak Mohd. Ali.

FRIM's Awards Day and 21st Anniversary was held at Dewan Perdana FELDA, Jalan Semarak, Kuala Lumpur on 16 November 2006. Y. Bhg. Dato' Suboh Mohd. Yassin, the Secretary General of the Ministry of Natural Resources and Environment officiated the occasion. Highlights of the event included presentations of two new awards namely the MFRDB Award and the FRIM Director General's Award. Awards for excellent service (individual and group), long service, outstanding publications, community service, best research project and sports for the year were also presented.

MFRDB AWARD

The MFRDB award is the highest FRIM award presented to individuals who have shown outstanding and effective leadership qualities. These individuals have played a positive role in the achievements of their teams through their high quality contributions and exemplary self discipline. Evaluations of leadership were not only based on the official scope of duties but also on the awardee's social responsibilities and community relationships. The recipient for this award was Y. Bhg. Dato' Dr. Hj. Abdul Razak Mohd. Ali.



Y. Bhg. Dato' Dr. Hj. Abdul Razak Mohd. Ali menerima Anugerah MFRDB

Y. Bhg. Dato' Dr. Hj. Abdul Razak Mohd. Ali receiving the MFRDB Award



Y. Bhg. Dato' Dr. Abd. Latif Mohmod menerima Anugerah Ketua Pengarah

Y. Bhg. Dato' Dr. Abd. Latif Mohmod receiving the Director General Award

ANUGERAH KETUA PENGARAH

Anugerah Ketua Pengarah diberikan sebagai pengiktirafan kepada individu yang telah memberikan sumbangan yang penting dan komitmen yang tinggi terhadap pembangunan dan kemajuan FRIM. Calon-calon mestilah telah menghasilkan bilangan penerbitan berkualiti yang tertinggi pada tahun tersebut dan menjadi penerima pelbagai anugerah daripada organisasi dari luar FRIM. Penerima anugerah juga mesti berkhidmat di FRIM atau di mana-mana jabatan kerajaan selama 20 tahun atau lebih. Penerima anugerah ini ialah Y. Bhg. Dato' Dr. Abd. Latif Mohmod.

DIRECTOR GENERAL'S AWARD

The Director General's award is given in recognition of significant contributions and high commitment to FRIM's development and advancement. Candidates should have the highest number of quality publications for the year and be recipients of awards from organisations other than FRIM. Awardees should have 20 or more years of service with FRIM or in a government department. The recipient for this award was Y. Bhg. Dato' Dr. Abd. Latif Mohmod.

ANUGERAH PEKERJA TERBAIK TAHUNAN THE BEST EMPLOYEE AWARDS

| Pegawai Penyelidik <i>Research Officer</i> | Pegawai Sokongan <i>Supporting staff</i> |
|-----------------------------------------------|---------------------------------------------|
| Dr. Rasadah Mat Ali | Parthiban Marimuthu |



Dr. Rasadah Mat Ali menerima Anugerah Pekerja Terbaik
Dr. Rasadah Mat Ali receiving the Best Employee Award



Parthiban Marimuthu menerima Anugerah Pekerja Terbaik
Parthiban Marimuthu receiving the Best Employee Award

ANUGERAH KHIDMAT CEMERLANG EXCELLENT SERVICE AWARDS

Penerima Individu Individual Awardees

Pegawai Penyelidik Research Officer

Dr. Ang Lai Hoe
Dr. Raja Barizan Raja Sulaiman
Boon Kok San
Liza Ismail
Rafeadah Rusli
Sam Yen Yen

Dr. Adzmi Yaacob
Dr. Richard Chung Cheng Kong
Mohd. Parid Mamat
Nik Zanariah Nik Mahmood
Shaharuddin Hashim
Zahari Othman



Nik Zanariah Nik Mahmood menerima Anugerah Khidmat Cemerlang
Nik Zanariah Nik Mahmood receiving the Excellent Service Award



Rafeadah Rusli menerima Anugerah Khidmat Cemerlang
Rafeadah Rusli receiving the Excellent Service Award



Rosidi Sulaiman menerima Anugerah Khidmat Cemerlang
Rosidi Sulaiman receiving the Excellent Service Award

Kumpulan Sokongan
Supporting Staff

Rozaida Latip
Rozita Ahmad
Zaitun Said
Nazarudin Ramli
Rodziah Hashim
Norbaite Saharuddin
Ab. Jalil Muhammad
Arshad Omar
Mat Yaacob Che Wan
Mohd. Zaini Ujang
Siti Asha Abu Bakar
Damanhuri Sabari
Kamal Ariffin Ismail
Mohd. Zahari Mohd. Noor
Sabariah Sani
Samsul Bahrin Abdullah
Yazid N yan
Zainun Othman
Zamri Zainuddin
Jura Din
Sukinah Jamaludin
Norhayati Yusoff

Roziyah Ayoub
Faridah Ismail
Sarina Hussin
Siti Baizurah Osman
Suzrina Shamsuddin
Zariza Mohamed Yusof
Mohamad Rosdi Abdul Kadir
Fatimah A. Azid @ Abd. Aziz
Aminudin Abd. Aziz
Salehin Jantan
Zakaria Yusof
Shah Mohd. Darus
Rosidi Sulaiman
Rosnaidah Ibrahim
Fauziah Din
Rohana Idris
Zulifah Omar
Mohd. Saad Mat Som
Ahmad Marhani
Majid Omar
Nur Asmah Safian
Rosmadi Salim



Ab. Jalil Muhammad menerima Anugerah Khidmat Cemerlang
Ab. Jalil Muhammad receiving the Excellent Service Award



Dr. Norwati Adnan menerima Anugerah Sukan
Dr. Norwati Adnan receiving the Sports Award



Norhayati Yusoff menerima Anugerah Khidmat Cemerlang
Norhayati Yusoff receiving the Excellent Service Award



Sarina Hussin menerima Anugerah Khidmat Cemerlang
Sarina Hussin receiving the Excellent Service Award

Kumpulan
Group

| Makmal Anatomi Kayu Wood Anatomy Laboratory | Unit Silvikultur Hutan Ladang Forest Plantation Silviculture Unit |
|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dr. Ani Sulaiman Lim Seng Choon Mohd. Zahari Mohd. Noor | Dr. Ahmad Zuhaidi Yahya Amir Saaiffudin Kassim Kamarul Hizam Hamsan Rosdy Taher Mahat Judin Zaihari Mohamad Ahmad Sariani Salimat Sumardi Husin Mohd. Tarmizi Tajuddin Mohd. Adnan Mohd. Idris Zolkiffe Md. Isa |

ANUGERAH KHIDMAT MASYARAKAT
COMMUNITY SERVICE AWARDS

Rosmadi Salim

ANUGERAH KHIDMAT SETIA
LONG SERVICE AWARDS

| Penerima Awardees | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dr. Che Ab. Rahim Hj. Nik Dr. Lee Su See Dr. Mohd. Nor Mohd. Yusoff Dr. Rahim Sudin Dr. Tan Yu Eng Azmi Mahyuddin Sharifah Maulana Eshah Ariffin Hashim Mohd. Siti Asha Abu Bakar Chong Yoon Thai Mohd. Zaini Ujang Saimas Ariffin Abu Husin Harun Rusli Mahidin Abd. Rahim Ahmad | Norrahmad Buyong Ahmad Hashim Abd. Rahim Omar Mohd. Nor Alias Abd. Rahim Hj. Yunus Zakaria Ariffin Gunasegaran Ponnusamy Shaari Jantan Othman Hasin Abdul Razak Omar Kunasegaran Muthu Abdul Rahim Razali Mat Said Osman Mohd. Nanyan Ismail Saari Ibrahim |



Dr. Mohd. Nor Mohd. Yusoff menerima Anugerah Khidmat Setia
Dr. Mohd. Nor Mohd. Yusoff receiving the Long Service Award



Eshah Ariffin menerima Anugerah Khidmat Setia
Eshah Ariffin receiving the Long Service Award



Saimas Ariffin menerima Anugerah Khidmat Setia
Saimas Ariffin receiving the Long Service Award

ANUGERAH PERSEKITARAN KERJA TERBAIK **BEST WORK ENVIRONMENT AWARD**

Penerima Awardees

Kategori Pejabat *Division Category*

Pertama First

Cawangan Bioteknologi (Genetik)
Biotechnology (Genetic) Branch

Kedua Second

Cawangan Penyelenggaraan
Maintenance Branch

Kategori Makmal/Bengkel/Stesen Penyelidikan Luar *Laboratory/Workshop/Field Research Station Category*

Pertama First

Makmal Tanah Tanah
Soil Laboratory

Kedua Second

Makmal Biji Benih
Seed Laboratory

ANUGERAH PENERBITAN **PUBLICATION AWARDS**

Anugerah ini diberikan kepada Pegawai Penyelidik yang menghasilkan penerbitan yang terbaik bagi tahun tersebut. Pemenang bagi pelbagai kategori penerbitan tahun 2004 ialah:

These awards are conferred to Research Officers for their outstanding publications for the year. Winners of the various categories of publications in 2006 were as follows:

ANUGERAH KHAS PENERBITAN
SPECIAL PUBLICATIONS AWARDS

Penerima Awardees

Jurnal Terbanyak *Most Journal Papers*

Pertama *First*

Dr. Noor Azlin Yahya

Kedua *Second*

Dr. Elizabeth Philip

Penyunting Terbaik *Best Editor*

Pertama *First*

Prof. Dr. E. Soepadmo

Penghargaan *Consolation*

Dr. Chan Hung Tuck



Prof. Dr. Soepadmo menerima Anugerah Penyunting Terbaik
Prof. Dr. Soepadmo receiving the Best Editor Award

Penerbitan Teknikal *Technical Papers*

Penerima Awardees

Pertama *First*

Laboratory and field tests of the effectiveness of the Lemon-Eucalyptus extract, Citridiol as a repellent against land leeches of the genus *Haemadipsa* (Haemadipsidae)
Laurence G. Kirton

Kedua *Second*

1. Basal root rot, a new disease of Teak (*Tectona grandis*) in Malaysia caused by *Phellinus noxius*
Mohd. Farid Ahmad, Lee Su See, Maziah Zakaria, Mohd. Rosli Haron and Norwati Muhammad
2. Adhesion and bonding properties of ply-bamboo manufactured from *Gigantochloa scortechinii*
Mohd. Khairun Anwar Uyup, Paridah Md. Tahir, Hamdan Husain, Abd. Latif Mohmod and Zaidon Ashaari



Dr. Laurence G. Kirton menerima Anugerah Penerbitan Teknikal Terbaik
Dr. Laurence G. Kirton receiving the Best Technical Paper Award

Penerbitan Separa/Bukan Teknikal
Semi/Non-Technical Papers

Penerima Awardees

Pertama First

Stocking and composition second rotation forest

Samsudin Musa, Abdul Rahim Kassim, Khairul Nazwan and Ahmad Jahar

Kedua Second

Improving the socio-economics livelihood of indigenous communities via eco-tourism development in Malaysia

Lim Hin Fui, Woon Weng Chuen and Mohd. Parid Mamat

Ketiga Third

The wood pulp and paper sector – A new source of economic growth for Malaysia

Norini Haron



Samsudin Musa menerima Anugerah Penerbitan Separa/Bukan Teknikal Terbaik
Samsudin Musa receiving the Best Semi/Non-Technical Paper Award



Dr. Ahmad Fauzi Puasa menerima Anugerah Tesis Terbaik
Dr. Ahmad Fauzi Puasa receiving the Best Thesis Award

Tesis Terbaik
Best Thesis

Penerima Awardees

Kategori Ph.D. Ph.D. Category

Pertama First

- The economic impacts of sawn timber export levy removal on the Peninsular Malaysia's economy (UPM)
Ahmad Fauzi Puasa
- Spatial structure and impact of logging on genetic diversity of selected tropical tree species. (UM)
Kevin Ng Kit Siong

Penghargaan Consolation

Ecology and phenotypic variations of *Vitellaria paradoxa* sub species *nilotica* in Ethiopia (UPM)
Denribe Gurma Senti

Kategori M.Sc. M.Sc. Category

Pertama First

Kesan penambahan kanji kation ke dalam pulpa kraft hybrid *Acacia* ke atas sifat sifat fizikal dan mekanikal kertas (UKM)
Latifah Jasmani

Kedua *Second*

- Evaluation of oriented strand board made from rubberwood using phenol formaldehyde as a binder (UPM)
Suffian Misran
- Fabrikasi sensor kimia optik berasaskan kaedah spektroskopi pantulan dan pendarfluor untuk penentuan kapsaisin (UKM)
Mohamad Nasir Mat Arip

Penghargaan *Consolation*

- Modes of failure and microscopic failures of Betong bamboo strips loaded in shear, bending, tension and compression (UiTM)
Shahril Anuar Sahari
- Application of remote sensing technology to estimate leaf area index in Ayer Hitam Forest Reserve, Puchong, Selangor, Malaysia (UPM)
Wong Zee Yeng

ANUGERAH PENYELIDIKAN TERBAIK *BEST RESEARCH AWARD*

Penerima *Awardees*

Pertama *First*

- Evaluation of antioxidant and skin whitening properties in nine species of ulam for product development and commercialization
Vimala Subramaniam, Dr. Mohd. Ilham Adenan, Abdul Rashih Ahmad, Rohana Sahdan and Juliza Mohamed
- High Temperature Drying (HTD) system to produce eco-friendly rubberwood stocks used in manufacturing wooden furniture for the export market
Choo Kheng Ten, Sik Huei Shing and Ramzul Iklas Ablah



Kakitangan di majlis makan malam Hari Anugerah dan Ulang Tahun FRIM ke-21
Staff members at the FRIM's Awards Day and 21st Anniversary dinner



Persembahan kumpulan koir FRIM
Presentation by FRIM choir

SIMPOSIUM “PACIFIC RIM BIO-BASED COMPOSITES” KELAPAN

Simposium ini diadakan dari 21 hingga 24 November di Hotel Legend, Kuala Lumpur. Tema simposium ialah “Advances and Challenges in Bio-composites”. Objektif utama simposium antarabangsa ini adalah untuk menyediakan satu forum untuk membincangkan pertukaran idea dan maklumat tentang penemuan dan perkembangan terkini dalam biokomposit. Peserta terdiri daripada saintis dan pakar dari industri yang berkaitan, agensi kerajaan, universiti dan institusi penyelidikan. Simposium turut menggalakkan pengukuhan kerjasama dan jaringan kerja di kalangan penyelidik, pakar, pengeluar dan pembekal jentera ke arah pembangunan industri biokomposit. Simposium ini telah merangkumi bidang-bidang yang berkaitan iaitu:

- Sumber bio
- Perekat dan perekatan
- Modifikasi kimia ke atas selulosa
- Teknologi pemrosesan
- Teknik analisis yang baru
- Pembangunan mampan biokomposit
- Produk komposit yang baru
- Ekonomi, pengurusan dan pemasaran

Simposium ini dianjurkan bersama oleh Institut Penyelidikan Perhutanan Malaysia (FRIM), Universiti Putra Malaysia (UPM), Universiti Teknologi Mara (UiTM), Universiti Sains Malaysia (USM), Lembaga Industri Kayu-Kayan Malaysia (MTIB), Persatuan Pengeluar Panel Malaysia (MPMA), Majlis Kayu-Kayan Malaysia (MTC), Lembaga Sawit Malaysia (MPOB), SIRIM Berhad dan Universiti Kebangsaan Malaysia (UKM).

EIGHTH PACIFIC RIM BIO-BASED COMPOSITES SYMPOSIUM

The Eighth Pacific Rim Bio-Based Composites Symposium was held from 21 to 24 November at the Legend Hotel, in Kuala Lumpur. The theme of the Symposium was entitled “Advances and Challenges in Bio-composites”. The key objective of this international symposium was to provide a forum for discussion and to facilitate the exchange of ideas and information on the latest development and findings in bio-composites. Among those who attended were scientists and experts from relevant industries, government agencies, universities and research institutions. The Symposium also encouraged the promotion and strengthening of cooperation and networking amongst the researchers, experts, manufacturers and machine suppliers for the development of the bio-composite industry. The Symposium covered the following areas of interest:

- Bio-resources
- Adhesive and bonding
- Chemical modification of cellulose
- Processing technologies
- New analytical technique
- Sustainable development of bio-composites
- New composite products
- Economics, management and marketing

The Symposium was jointly organized by the Forest Research Institute Malaysia (FRIM), Universiti Putra Malaysia (UPM), Universiti Teknologi Mara (UiTM), Universiti Sains Malaysia (USM), Malaysian Timber Industry Board (MTIB), Malaysian Panel-Products Manufacturers Association (MPMA), Malaysian



Peserta Simposium Bio-Based Composites
Participants of the Bio-Based Composites Symposium

Bengkel pra-simposium telah diadakan pada 20 November dan dihadiri oleh seramai 81 orang peserta yang dikendalikan oleh Prof. Roger Rowell dan Prof. Kozlowski dari Poland.

Simposium utama telah dirasmikan oleh Y.B. Dato' S. Sothinathan, Timbalan Menteri Sumber Asli dan Alam Sekitar. Satu kertas ucaptama, tiga sidang pleno dan lebih 55 kertas kerja telah dibentangkan. Sebanyak 33 poster turut dipamerkan.

Sejumlah 193 orang peserta menghadiri Simposium ini, 45 orang daripadanya merupakan peserta dari luar negara. Logo Pacific RIM Bio-based Composites turut diperkenalkan. Ia terdiri daripada glob rantau Asia Pasifik dengan pelbagai panel komposit kayu. Simbol kualiti juga turut ditonjolkan di dalam logo tersebut. Lawatan ke Kilang DongHwa Fibreboard turut dianjurkan dengan dihadiri oleh 61 orang peserta.

SEMINAR KEBANGSAAN BIOTEKNOLOGI HUTAN

Seminar dan Bengkel Kebangsaan Bioteknologi Hutan yang bertemakan "Biotechnology – Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest" telah diadakan pada 4 hingga 7 Disember di FRIM. Objektif seminar ialah:

- Untuk berkongsi maklumat terkini tentang polisi, R&D dan mekanisme pembiayaan yang berkaitan dengan bioteknologi hutan
- Untuk mewujudkan kerjasama dan rangkaian kerja di kalangan agensi dan syarikat tentang bioteknologi hutan
- Untuk menyediakan peserta dengan pengetahuan amali dalam teknik-teknik terkini bagi pemuliharaan dan penggunaan sumber-sumber hutan

Sejumlah empat ucaptama, lapan kertas kerja pleno dan sembilan kertas kerja teknikal telah

Timber Council (MTC), Malaysian Palm Oil Board (MPOB), SIRIM Berhad and Universiti Kebangsaan Malaysia (UKM).

A pre Symposium Workshop was held on the 20 November and eighty one participants took part. Prof. Roger Rowell and Prof. Kozlowski from Poland were the resource persons at this workshop.

The main Symposium was officially opened by Y.B. Dato' Sothinathan, the Deputy Minister of Natural Resources and the Environment. One keynote paper, three plenary lectures and over fifty five oral papers were presented at the main Symposium. Thirty three poster papers were also displayed.

A total of 193 participants attended the Symposium in which 45 were foreign participants. During the Symposium, the Pacific RIM Bio-based Composites Logo was unveiled. It consisted of a globe of the Asia Pacific region with various wood composite panels. The quality symbol was also highlighted within the logo. An In-Symposium visit was arranged on the 23 November in which participants visited the DongHwa Fibreboard Factory at Putrajaya. The visit was attended by 61 participants.

NATIONAL SEMINAR ON FOREST BIOTECHNOLOGY

The National Seminar and Workshop on Forest Biotechnology themed "Biotechnology – Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest: was held from 4 to 7 December at FRIM. The objectives of the conference were;

- *To share the most recent information on policy, R&D and funding mechanisms related to forest biotechnology*
- *To establish cooperation and networks among relevant agencies and companies on forest biotechnology*

- *To provide participants with hands-on knowledge in the recent biotechnology techniques for forest resources conservation and utilization.*

A total of four keynote papers, seven plenary papers and nine technical papers were presented. The seminar was divided into non-technical and technical sessions. A total of about 300 participants



Y.B. Dato' Sazmi Miah merasmikan Seminar Bioteknologi Hutan
Y.B. Dato' Sazmi Miah officiated the Seminar on Forest Biotechnology

dibentangkan. Seminar dibahagikan kepada bahagian teknikal dan bukan teknikal. Seramai 300 orang peserta yang terdiri daripada ahli akademik, saintis, pembuat polisi, usahawan, usahawan bioteknologi serta ahli sektor korporat dan kewangan telah menghadiri seminar ini.

PERSIDANGAN ANTARABANGSA PERHUTANAN TANI 2006

Persidangan Antarabangsa Perhutanan Tani 2006 yang bertemakan "Harnessing the Benefits" telah diadakan dari 1 hingga 2 Ogos. Persidangan ini merupakan usaha sama FRIM dengan APAFRI, MSPP dan MARDI. Persidangan menyediakan forum yang berguna bagi membincangkan tentang pengkomersialan perdagangan perhutanan tani. Objektif persidangan ialah:

- Untuk berkongsi, berbincang dan mengumpul maklumat, pengalaman dan idea saintifik di kalangan saintis dan profesional dalam bidang perhutanan tani dan bidang yang berkaitan
- Untuk membangunkan strategi kerja sistem perhutanan tani bagi mengguna pakai dalam projek komersial seperti perusahaan perdagangan di kawasan tropika

comprising academicians, scientists, policy makers, entrepreneurs, biotechnopreneurs and members of the corporate and financial sectors attended the conference.

INTERNATIONAL AGROFORESTRY CONFERENCE 2006

The International Agroforestry Conference 2006 themed 'Harnessing the Benefits' was held from 1 to 2 August. This conference was a joint effort between FRIM and three other organisations namely APAFRI, MSPP and MARDI. The Conference provided a useful forum to discuss agroforestry as a commercially attractive and viable enterprise. The objectives of the conference were:

- *To share, discuss and collate scientific-based knowledge, experiences and ideas among scientist and professionals in the field of agroforestry and related disciplines*
- *To develop workable strategies of agroforestry systems for adoption in the commercial project as sustainable business enterprises/ventures in the tropics*



Y.B. Dato' S. Sothnathan, Timbalan Menteri NRE menyampaikan ucapan alu-aluan pada Persidangan Perhutanan Tani
Y.B. Dato' S. Sothnathan, the Deputy Minister of NRE delivering the opening speech at the Agroforestry Conference

BENGGEL UJIAN KECEKAPAN UNTUK KAYU BERAWET CCA DAN KAYU TERAWAT

Bengkel Ujian Kecekapan untuk Kayu Berawet CCA dan Kayu Terawat telah diadakan pada 18 Disember 2006 di FRIM. Bengkel ini bertujuan untuk berkongsi pengetahuan dan pengalaman FRIM sebagai Penyedia Ujian Kecekapan (PT) di samping untuk menyebarkan maklumat yang berkaitan dengan program PT. Bengkel dihadiri oleh 37 peserta dari makmal agensi kerajaan dan swasta. Empat kertas kerja telah dibentangkan dan dibincangkan termasuklah satu kertas kerja oleh En Shahrul Sadri Alwi, Penolong Pengarah Prinsipal Kanan, (Bahagian Akreditasi), Jabatan Standard Malaysia.

SEMINAR TENAGA DARIPADA BIOJISIM 2006

Seminar Tenaga daripada Biojism 2006 telah diadakan di FRIM, Kepong, Selangor dari 25 hingga 26 Julai 2006 dengan tema "Conversion of Bioresources into Energy and other Applications". Seminar dirasmikan oleh Y.B. Dato' S. Sothinathan, Timbalan Menteri Sumber Asli dan Alam Sekitar (NRE). Objektif seminar yang dianjurkan oleh Bahagian Pembangunan Produk, FRIM ini adalah:

- Untuk menggalakkan pendekatan secara mampan ke arah penggunaan sumber bio tenaga yang cekap
- Untuk menyediakan satu landasan bagi penyebaran maklumat melalui pertukaran penemuan serta pandangan di kalangan peserta
- Untuk meneroka dan seterusnya mengemas kini isu-isu yang berkaitan dengan potensi tenaga dari biojism yang boleh diperbaharu.

Seminar ini berjaya menarik 63 orang peserta dari pelbagai agensi kerajaan dan swasta. Sejumlah 14 kertas kerja dan dua poster telah dibentangkan pada seminar ini. Satu lawatan ke titian kanopi FRIM turut diadakan pada hari kedua seminar.

PERSIDANGAN HUTAN BANDAR: MENGURUSKAN KEHIJAUAN BANDAR SECARA MAMPAN

Seminar dua hari ini telah dianjurkan oleh Bahagian Perhutanan dan Pemuliharaan pada 6 hingga 8 Jun 2006 di Hotel Crown Princess, Kuala Lumpur. Seminar ini merupakan anjuran bersama Asia Pacific Association of Forestry Research Institution (APAFRI), Kuala Lumpur City Hall (DBKL), Universiti Putra Malaysia (UPM) dan Forest and Landscape Denmark (FLD). Seramai 87 peserta telah

WORKSHOP ON PROFICIENCY TESTING PROGRAMME FOR CCA WOOD PRESERVATIVE AND TREATED WOOD

The Workshop on Proficiency Testing Programme for CCA Wood Preservative and Treated Wood was held on 18 December 2006 in FRIM. The objective of the workshop was to share the knowledge and experience of FRIM as a Proficiency Testing (PT) Provider and disseminate information related to PT programme. The workshop was attended by 37 participants from government and private laboratories. Four papers were presented and discussed including one paper from En. Shahrul Sadri Alwi, Senior Principal Assistance Director (Accreditation Division), Department of Standards Malaysia.

SEMINAR ON ENERGY FROM BIOMASS 2006

The Seminar on Energy from Biomass 2006 was held in FRIM Kepong, Selangor from 25 to 26 July 2006 with the theme "Conversion of Bioresources into Energy and other Applications". The seminar was officiated by Y.B. Dato' S. Sothinathan, the Deputy Minister of the Natural Resources and Environment Ministry (NRE). The seminar was organized by the Product Development Division of FRIM with the following objectives:

- To promote a sustainable approach towards efficient utilization of bioresources for energy
- To provide a platform for dissemination of information through exchange of findings and views amongst participating agencies
- To explore and update relevant issues pertaining to the potential of renewable energy from biomass

The seminar attracted 63 participants from various government agencies and private sector. Altogether, 14 papers and two posters were presented at the seminar. A day outing to FRIM's canopy walkway was also organised on the second day of the seminar.

URBAN FORESTRY CONFERENCE: MANAGING URBAN GREEN FOR SUSTAINABLE CITIES

The two-day conference with post conference tour to Putrajaya was organized by the Forestry and Conservation Division from 6 to 8 June 2006, at Crown Princess Hotel, Kuala Lumpur. The co-organising agencies were Asia Pacific Association of Forestry Research Institution (APAFRI), Kuala Lumpur City Hall (DBKL), Universiti Putra Malaysia

menyertai seminar ini meliputi peserta tempatan dan antarabangsa. Peserta luar negara yang terlibat adalah dari Singapura, Filipina, Indonesia, China dan Denmark.

Seminar ini bertujuan untuk melihat kembali status dan pencapaian dalam bidang hutan bandar di rantau Asia Tenggara dan menyediakan landasan bagi pertukaran idea, informasi dan menjalinkan rangkaian perhubungan terutama di kalangan peserta dari pelbagai negara dalam bidang hutan bandar khususnya.

Sebanyak 32 kertas kerja telah dibentangkan, enam poster dipamerkan. Banyak isu terutama yang berkaitan dengan sosio-ekonomi dalam bidang hutan bandar dibincangkan. Di samping itu isu-isu baru seperti fungsi kawasan hijau dan 'roof top greenery' juga diutarakan dalam seminar ini. Penekanan juga diberikan kepada perlunya meningkatkan tahap kesedaran di kalangan masyarakat ke arah pembangunan hutan bandar. Isu mengenai penyelenggaraan, termasuk pengurusan penyakit, pemilihan pokok, teknik penanaman juga dibentang dan penyelesaian masalah dibincangkan.

(UPM) and Forest and Landscape Denmark (FLD). The successful event saw 87 local and international participants from Singapore, Philippines, Indonesia, Republic of China and Denmark.

The aim of this conference was to review the progress and status of urban forestry in South East Asia region, to establish a platform to exchange information, ideas and to learn from each other about all aspects of urban greening and urban forestry and to establish networking among participants from different countries for a possible collaboration in future urban forestry projects.

The conference covered five sessions with two keynote papers. The themes discussed included status and challenges in creating urban forest, planning of urban greenery for sustainable development, management of urban forest, species diversification and growth performance in urban trees, benefits and socio-economic evaluation of urban forest.

A total of 32 oral papers together with six posters were presented in the conference. One of the highlights of the conference was that the benefits and socio-economic evaluation of urban forest were discussed for the first time. New issues like urban heat islands, green elements, carbon sinks and air pollutions improvised planting techniques in 'land scarce' areas especially in high-rise building through roof top greenery, was also discussed. On the education aspect, community development was encouraged especially in inculcating the sense of ownership and responsibility of caring for urban forest. Problems arising from maintenance, pests, suitability of species, tree-planting techniques were presented and solutions discussed.



Ketua Pengarah FRIM menyampaikan ucapan alu-aluan di Persidangan Hutan Bandar

The Director General of FRIM delivering the opening speech at the Urban Forestry Conference

LAWATAN RASMI

OFFICIAL VISITS

| Tarikh <i>Date</i> | Pelawat <i>Visitor</i> |
|--------------------|----------------------------------------------------------------------------------------|
| 10 February | Pegawai Utama (Universitas Riau Pekan Baru, Indonesia) |
| 15 March | H.E. The Ambassador from the Republic of Korea |
| 16 March | Pengurus Besar (Johor Biotechnology & Biodiversity Secretariat, J-Biotech) |
| 29 March | Representatives from the Embassy of Japan |
| 14 April | Y.B. Dato' Seri Azmi Bin Khalid (Minister of the NRE) |
| 16 June | Y. Bhg. Datuk Haji Abdul Rahim Ismail (Menteri, Pertanian dan Industri Makanan, Sabah) |
| 19 June | Delegation from Nigeria |
| 28 June | Representatives from the Incorporated Society of Planters |
| 17 July | Yang DiPertua Majlis Perbandaran Kajang |
| 7 August | Representatives from the Embassy of France |
| 7 August | Parliamentary Secretary for Agriculture (Forestry and Fisheries Japan) |
| 16 August | Representatives from the Persatuan Pekilang-Pekilang Malaysia (FMM) |
| 26 August | Vice Chancellor (University of Brighton, U.K.) |
| 1 September | The Director General of Forestry and Research Agency (FORDA), Indonesia |
| 29 October | H.E. the Deputy Prime Minister of United Kingdom and Ireland |
| 29 November | H.E. the High Commissioner of Canada |
| 21 December | Senior Forestry Officers of the Socialist Republic of Vietnam |
| 21 December | Delegation from the European Parliament |



Y.B. Dato' Seri Azmi Khalid melawat Bahagian Bioteknologi FRIM
Y.B. Dato' Seri Azmi Khalid visiting FRIM's Biotechnology Division



Y.Bhg. Datuk Haji Abdul Rahim Ismail melawat Makmal Biji Benih
Y.Bhg. Datuk Haji Abdul Rahim Ismail visiting the Seed Laboratory

PENDAHULUAN

Secara keseluruhannya, pencapaian prestasi kewangan Lembaga bagi tahun berakhir 31 Disember 2006 adalah mengalakkan, jika diukur dari segi kawalan dan prestasi perbelanjaan. Tahun 2006 merupakan tahun pertama dalam RMK 9.

PENYATA PENDAPATAN

FRIM telah dapat menjalankan aktiviti dengan lancar kerana mendapat bantuan kewangan bukan sahaja daripada Kerajaan Persekutuan bagi perbelanjaan Operasi (Mengurus) dan Pembangunan, tetapi juga daripada IRPA atau kini dikenali sebagai dana e-Science dan wang levi Tabung Pembangunan Industri Kayu-Kayan Malaysia yang dikendalikan oleh MTIB serta organisasi dari dalam dan luar negara untuk menjalankan aktiviti penyelidikan dan pembangunannya.

Sumbangan Kerajaan Malaysia tidak banyak berubah, iaitu sebanyak RM50,671,612 berbanding RM50,815,427 dalam tahun sebelumnya. Dalam tahun di bawah kajian, Lembaga menerima peruntukan Mengurus sebanyak RM33,764,000, Pembangunan RM12,480,000 dan IRPA/e-Science sejumlah RM2,826,131 dan pada masa yang sama Lembaga telah memperoleh wang projek levi bernilai RM1,251,217.

INTRODUCTION

Generally, the financial performance of the Board for the year ended 31 December 2006 was satisfactory as FRIM had taken into account all necessary financial and expenditure controls. The year 2006 also marked the beginning of the Ninth Malaysia Plan.

INCOME STATEMENT

FRIM has been able to implement its activities smoothly due to financial allocations not only from the Malaysian Government but from IRPA (now known as the e-Science Fund) and funds obtained from a levy by the Malaysian Wood Industry Development Fund managed by the Malaysian Timber Industry Board (MTIB), and also funds obtained from national and international organisations.

The Malaysian Government allocation of RM50,671,612 did not differ much from the RM50,815,427 allocated the year before. In the year under review, the Board was allocated RM33,764,000 for Operations, RM12,480,000 for Development, RM2,826,131 for IRPA/e-Science Fund and levy allocations amounting to RM1,251,217.



PENYATA PERBELANJAAN

Perbelanjaan emolument Lembaga dan caruman Tabung Kumpulanwang Pencen diperuntukkan kepada 848 kakitangan. Daripada jumlah tersebut, 666 ialah kakitangan tetap. Bayaran emolument dan caruman Tabung Kumpulanwang Pencen mewakili 44% daripada perbelanjaan Mengurus Lembaga atau RM29,014,691 daripada keseluruhan peruntukan lembaga. Lembaga mencarum 17.5% daripada gaji pokok kakitangan Lembaga yang berjawatan tetap dan berpencen ke Tabung tersebut. Manakala bagi mereka yang memilih KWSP, Lembaga perlu menyumbang 12% daripada gaji dan elaun. Dengan itu, tidak ada tanggungan jangka panjang kepada Lembaga untuk kakitangan FRIM kecuali ganjaran cuti rehat (GCR) apabila kakitangan bersara.

Sebagai badan berkanun, Lembaga perlu menanggung kos perubatan pesara dan tanggungannya termasuk rawatan di IJN dan kelayakan-kelayakan pesara yang lain. Masih terdapat 88 jawatan kosong yang belum diisi dan Lembaga telah memohon peruntukan tambahan dalam tahun 2007 untuk membolehkan pengisian jawatan tersebut.

Elaun tetap telah meningkat dengan begitu ketara, iaitu sebanyak RM1,595,234, daripada RM4,106,034 kepada RM5,701,268 disebabkan oleh bayaran elaun sara hidup (COLA) dan kenaikan kadar beberapa elaun tetap yang lain. Terdapat juga kenaikan dalam perbelanjaan perjalanan, penyelenggaraan dan pembaikan kecil dan juga perbelanjaan yang lain. Bagi perbelanjaan yang lain, kenaikan ialah disebabkan oleh Lembaga telah mengembalikan wang projek yang tidak dibelanjakan kepada MTIB sebanyak RM3,943,952.

Namun demikian, terdapat pengurangan ketara bagi bayaran perkhidmatan ikhtisas, perkhidmatan lain dan hospital iaitu sebanyak RM8,470,570 daripada RM13,983,021. Sebabnya, pada tahun 2005, FRIM mengeluarkan peruntukan yang agak besar kepada projek pulpa dan kertas, sedangkan tiada pengeluaran dibuat dalam tahun 2006.

Pada tahun 2006, perbelanjaan modal ialah sebanyak RM4,945,573 berbanding dengan RM9,126,793 pada tahun sebelumnya. Antara perbelanjaan modal yang digunakan adalah untuk memperoleh mesin, perabot dan infrastruktur bangunan. Selain itu, Lembaga telah juga memperuntukkan RM890,988 untuk cukai pendapatan Lembaga.

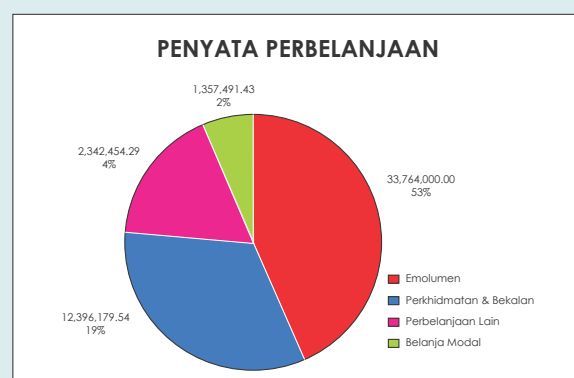
EXPENDITURE

In 2006, emolument expenditure and contributions to the Consolidated Pensions Funds was for 848 staff members. Of this, 666 were full time staff. Payments for emoluments and contributions to the Pensions Fund represented 44% or RM29,014,691 of the Board's Operational Expenditure. The Board contributed 17.5% of the basic pay of staff that is those who were confirmed and who also qualified for retirement benefits to the Fund. For those who opted for EPF contributions, the Board contributed 12% of the basic pay and allowance of staff members. With these contributions, there were no long term responsibility for the Board except for leave entitlement allowance (LEA) for staff when they retire.

As a statutory body, the Board was responsible for the health care of its retired staff including medical cost at IJN and other entitlements. There were also 88 unfilled positions in FRIM and the Board had requested additional allocations to fill these posts in 2007.

Fixed allowances had increased by RM1,595,234 from RM4,106,034 to RM5,701,268. This was due to the introduction of Costs Of Living Allowance (COLA) and an increase in other allowances. Expenditure for traveling, maintenance, small repairs and other expenses also rose. Significant increase in other expenses was largely related to the return of RM3,943,952 by the Board to MTIB in project monies which were not spent.

There was a marked decrease in the payment for professional services, other services and hospitality cost, reduced to RM8,470,570 from RM13,983,021. This is largely attributable to the fact that FRIM had spent quite a large amount on pulp and paper projects in 2005, whereas in 2006, none were spent.



Bayaran-bayaran lain adalah sejajar dengan aktiviti FRIM berdasarkan program dan projek serta peruntukan dan pembiayaan yang diluluskan oleh Lembaga dan Kerajaan. Bagi tahun di bawah kajian, pendapatan telah menunjukkan lebihan ke atas perbelanjaan sebanyak RM553,651.

ALIRAN TUNAI DAN PELABURAN

Lembaga tidak mengalami masalah dalam aliran dan kecairan tunai dan telah dapat menjelaskan semua tanggungjawab kewangan tepat pada masanya.

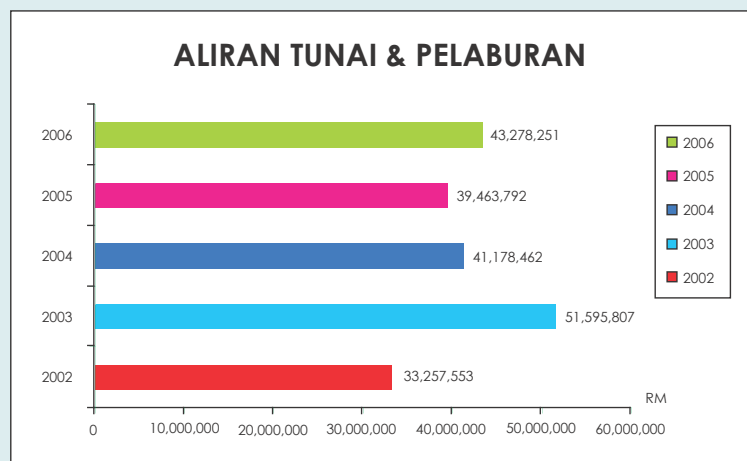
Pada masa ini Lembaga tidak dibenarkan melabur dalam instrumen kewangan selain yang diluluskan oleh Perbendaharaan Malaysia. Pada tahun 2006, Lembaga menambah pelaburannya dalam institusi Amanah Raya Berhad (ARB) daripada RM2,000,000 kepada RM5,114,042 yang memberi pulangan 5% berbanding 3 - 3.6% dalam simpanan tetap. Lembaga akan terus mengkaji pelaburan yang tidak mempunyai risiko pengurangan modal dan yang telah diluluskan oleh Perbendaharaan Malaysia.

In the year under review, capital expenditure was at RM4,945,573, compared to RM9,126,793 to the year before. Some of the capital expenditures included the purchase of machinery, furniture and fittings, infrastructure and others. The Board had also allocated RM890,988 for income tax. Other payments and allocations were for FRIM activities and projects which were sanctioned by the Board and the Government. For the year under review, the income versus spending showed that income exceeded expenditure by RM553,651.

INVESTMENTS AND CASH FLOW

The Board did not face any cash flow problems and had been able to settle all financial obligations within the scheduled timeframe.

Currently, the Board is only allowed to invest in institutions approved by the Treasury. The Board in 2006 had increased its investment in Amanah Raya Berhad (ARB) from RM2,000,000 to RM5,114,042 and this had generated a favorable income of 5% compared to the 3 - 3.6% interest arising from fixed savings. The board will continue to look out for non risk investments which have been approved by the Treasury.



KUNCI KIRA-KIRA

Kedudukan Kunci Kira-Kira Lembaga terus kukuh dengan kedudukan aset FRIM sebanyak RM81,662,821. Tunai dan bersamaan tunai pada 31 Disember 2006 masih munasabah dalam lingkungan RM43 juta.

BALANCE SHEET

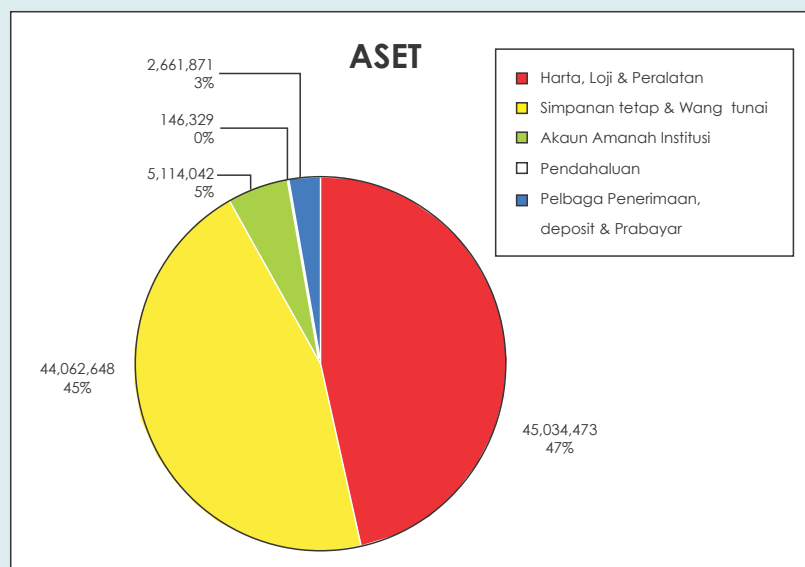
The Board Balance Sheet remained strong and stable with assets worth RM81,662,821. Cash and equivalents as at 31 December 2006 were at an acceptable value of RM43 million.

Lembaga tidak mengalami masalah penerimaan yang tidak dikutip kerana jumlahnya secara relatif adalah kecil. Namun demikian, Lembaga terus membuat pemantauan dan tindakan susulan ke atas segala penerimaan yang belum dikutip termasuk mengambil tindakan undang-undang kepada mereka yang gagal menjelaskannya. Lembaga telah memberi kemudahan pinjaman komputer, kenderaan dan perumahan kepada kakitangannya. Baki tunai bagi ketiga-tiga tabung pusingan ini setakat 31 Disember 2006 ialah sebanyak RM5,773,996 dan mencukupi untuk memberi kemudahan tersebut tanpa kakitangan menunggu giliran. Jumlah pinjaman setakat 31 Disember 2006 pula ialah RM3,881,184.

Lembaga turut memperkenalkan sistem semakan sendiri aset secara dalam talian bagi pengurusan aset serta sistem bayaran secara dalam talian bagi terimaan daripada pelanggan dan bayaran kepada kakitangan. Ini merupakan antara contoh bahawa sistem perakaunan FRIM terus dipertingkatkan ke arah amalan tadbir urus korporat yang baik, ketelusan serta kecekapan pemprosesan urusan kewangan. Dengan pengurusan kewangan dan perakaunan yang mantap, pengurusan FRIM dapat membuat keputusan dengan cepat dan Lembaga dapat mematuhi kehendak dan harapan pelanggan dan pihak-pihak yang berkepentingan dengannya.

The Board did not face any problem with receivables as the amount was relatively small. Notwithstanding, the Board had been continuously monitoring the situation and had taken the necessary actions towards all uncollected receivables. These actions included legal actions towards those who failed to make payments. The Board had also provided loans for computers, vehicles and housing loans to its staff. The revolving funds for the three loan accounts as at 31 December 2006 were RM5,773,996 and was sufficient such that staff members did not have to wait long to use this facility. Total loans as of 31 December 2006 was RM3,881,184.

The Board had introduced a self check on-line system for asset management and an online payment system for receivals from clients and payments to staff. These are examples showing that FRIM will constantly upgrade its financial management system to cater for good corporate governance, financial transparency and for a more professional finance management of the Board. With established financial management and accounting, the management of FRIM is able to make timely decision and the Board will be able to meet the requirements of its customers and stake holders.



PEGAWAI OFFICERS

Pada 2006, terdapat 666 kakitangan FRIM. Daripada jumlah ini, 196 merupakan Pegawai Penyelidik dan selebihnya ialah Penolong Pegawai Penyelidik serta Kakitangan Kumpulan Sokongan. Terdapat tujuh Pengarah Bahagian dan sepuluh Pengarah Program.

In 2006, FRIM had 666 staff members. Out of these 196 were Research Officers. There were seven Divisional Directors and ten Programme Directors.

| Komposisi Kakitangan Semasa <i>Current Staff composition</i> | No. |
|--------------------------------------------------------------------------------------|-----|
| Bilangan Kakitangan FRIM <i>Total number of FRIM staff</i> | 666 |
| Kategori Perjawatan <i>Staff Categories</i> | |
| Bilangan Pegawai Penyelidik (Jusa) <i>Number of Research Officers (Jusa)</i> | 11 |
| Bilangan Pegawai Penyelidik <i>Number of Research Officers</i> | 185 |
| Bilangan Penolong Pegawai Penyelidik <i>Number of Assistant Research Officers</i> | 43 |
| Bilangan Kakitangan Sokongan <i>Number of Supporting Staff</i> | 427 |

PEJABAT KETUA PENGARAH DIRECTOR GENERAL'S OFFICE

Ketua Pengarah *Director General*

Dato' Dr. Abdul Razak Mohd. Ali
DIMP, JMN, FMIC
B. Sc. (Hons.) (Tasmania)
Ph. D. (UM)

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

Dato' Dr. Wan Razali Wan Mohd.
DPMT, JSM, KMN, FIFM
Dip. Agric. (UPM)
B. Sc. For., M. Sc. (Louisiana State)
Ph. D. (Washington)

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

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

Ketua
Head

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

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

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

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

Norhasni Ramli
B. Sc. Chem. (UKM)

Mohd. Julian Borhanudin
B. Mgmt. (UNITAR)

Unit Hal Ehwal Antarabangsa dan Undang-undang
International and Legal Affairs Unit

Ketua
Head

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

Pegawai Penyelidik
Research Officers

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

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

Pegawai Penyelidik Kontrak
Research Officer (Contract)

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

Pegawai Undang-Undang
Legal Officer

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

Unit Perhubungan Korporat
Corporate Communication Unit

Ketua
Head

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

Pegawai Khidmat Korporat
Corporate Services Officers

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

Pegawai Informasi
Information Officer

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

Pegawai Perhubungan Awam
Public Relations Officer

Wahayu Abd. Wahab
B. Mass Comm. (UPM)

Penolong Pegawai Penyelidik
Assistant Research Officer

Haminuddin Abd. Wahab
Adv. Dip. (IT) (AIM)
B. Sc. (IT) (Canberra-PTPL)

Penolong Pegawai Penerangan
Assistant Information Officer

Azmarizawati Zainal Azhar
Dip. Sec. Sc. (UiTM)
B. Mass Comm. (UiTM)

Pereka Grafik
Graphic Artist

Jamaluddin Abdullah
Dip. Graphic Des. (Cosmopoint)

Program Tekno-Ekonomi
Techno-Economics Programme

Pengarah
Director

Dr. Woon Weng Chuen LIMIS
B. Sc. For. (UPM)
M. Sc. (UC Berkeley)
Ph. D. (Wales,UK)

Pegawai Penyelidik
Research Officers

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

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

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

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

Huda Farhana Mohamad 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
Bac. of Economics (UPM)
M. Sc. Marketing (UPM)

BAHAGIAN PENGURUSAN & MULTIMEDIA
MANAGEMENT & 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)

Faizatul Shima Mohd. Yunus
B. Eng. Comp. & Comm. Sys. (UPM)

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

Penolong Pegawai Penyelidik
Assistant Research Officers

Nurul Hilal A. Tarmidzi
Dip. Eng. Electr. Comm. (UTM)

Mohd. Azhar Ishak @ Asahak
Dip. Mech. Eng. (Politeknik)

Penolong Pegawai Sistem Maklumat
Assistant Information System Officers

Siti Zaleha Abdul Goni
Dip. Interact Multi.(Infotech MARA)

Omar Ali Abdul Rahim
Dip. Info. Tech. (Poly Ungku Omar)

Pegawai Penyelenggaraan
Maintenance Officers

Jamal Abdul Razak
Dip. Qty. Survey (UiTM)

Penolong Pegawai Tadbir
Assistant Administrative Officers

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

Md. Nasir Dayat

BAHAGIAN PENGURUSAN SUMBER MANUSIA
HUMAN RESOURCES MANAGEMENT DIVISION

Pengarah Kanan
Senior Director

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

Pegawai Penyelidik
Research Officers

Liza Ismail
B. Sc. Hort. (UPM)

Pegawai Tadbir
Administration Officer

Zamri Mohd. Zangi
B. Sc. (Hons.) Publ. Mgmt.(UUM)
Mohd. Asmawee Ismail
B. Hum. Res. Mgmt. (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)

Maizatulakhmaliza Mohamad
B. Acc. (Hons.) UiTM

Pegawai Penyelidik
Research Officers

Hj. Ashaari Hj. Mohd. Amin
B. Sc., M. Sc. (Louisiana State)

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

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. Stud. (UiTM)

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

Emylia Ayoub
Dip. Bank (UiTM)

BAHAGIAN PERHUTANAN DAN PEMULIHARAAN
FORESTRY AND CONSERVATION DIVISION

Pengarah Kanan
Senior Director

Dr. Abdul Rahim Nik AMN
Dip. Agric. (UPM)
B. Sc. For. (Louisiana State),
M. Sc. For. (West Virginia)
Ph. D. (Wales)



Pusat Biodiversiti Hutan Tropika
Tropical Forest Biodiversity Centre

Pengarah
Director

Dr. Saw Leng Guan
B. Sc. For. (UPM)
M. Sc., Ph. D. (Reading)

Pegawai Penyelidik
Research Officers

Dr. Pan Khang Aun
B. Sc. (UPM), M. Sc. (UM), Ph. D. (Salford)

Dr. Lillian Chua Swee Lian
B. Sc. (UKM), M. Sc. (London), Ph. D. (Bath)

Dr. Richard Chung Cheng Kong
B. Sc. (Hons.), M.Sc., Ph. D. (UM)

Noorsiha Ayop
B. Sc. (Hons.) (UM)

Sam Yen Yen
B. Agric. Sc., M. Agric. Sc. (UPM)

Norsham Suhaina Yaakob
B. Sc. Biol. (California State), M. Sc. (UKM)

Nor Ezzawanis Abdullah Thani
B. Sc. (Hons.) Biol. (UKM)

Hamidah Mamat
B. Sc. Geoinform. (UTM)

Phoon Sook Ngoh
B. Sc. (Hons.) Biol., M. Sc. (UPM)

Ummul Nazrah Abdul Rahman
B. Sc. Ed. (Hons.), M. Sc. (UKM)

Syahida Emiza Suhaimi
B. Sc. For. (UPM)

Chew Ming Yee
B. Sc. For. (UPM)

Elango Velautham
B.Sc. (Hons.) Hort. (UPM),
M. Sc. (Imperial College, London)

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).

Julia Sang
B. Sc. For. (UPM)

Khairudin Baharum
B. Sc. Comp. Graph.(UiTM)

Lai Ee May
B. Sc. Biol., M. Sc. Plant Biol. (USM)

Tasnim Ghazali
B. Sc. Bio-indus. (UPM)

Suzana Sabran
B. Sc. (UMS)

Rafidah Abdul Rahman
Dip. For., B. Sc. For. (UPM)

Wendy Yong Sze Yee
B. Sc. (Hons.) Biol., M. Sc. Pl. & Ani. Syst. (UPM)

Suhaida Mustafa
B. Sc. For. (UPM)

Suzaini Sulaiman
B. Sc. Eng. (Bio. & Agric.) (UPM)

Mariam Abdullah @ Jutta Poetz
B. Sc. Biol. (UPM)

Nadiyah Idris
B. Sc. (Hons.) Biol. (UKM)

Tan Hui Sin
B. Sc.For. (UPM)

Siti Eryani Suterisno
B. Sc. (Hons.) Biol. (UPM)

Lim Chung Lu
B. Sc. For. (UPM)

Yao Tze Leong
B. Sc. For. (UPM)

Aslina Baharum
B. Sc. (Hons.) E-Commerce (UMS)

Siti Munirah Mat Yunoh
B. Sc. (Hons.) Biol., M.Sc. Pl. Syst. (UKM)

Lee Gaik Ee
B. Sc. (Biol.), M.Sc. (UKM)

Program Pengurusan dan Ekologi Hutan
Forest Management and Ecology Programme

Pengarah Kanan
Senior Director

Dr. Shamsudin Ibrahim
B. Sc. For. (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. For. (UPM)
M. Sc. (AIT)
Ph. D. (Reading)

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

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

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

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

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

Samsudin Musa
B. Sc. For. (UPM)

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

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

Safiah @ Yusmah Muhd. Yusoff
Dip. Sc. (UiTM)
B. Sc. Geog., M. Sc. (UM)

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

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

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

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

Tan Sek Aun
B. Sc. Env. (UPM)

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

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

Azian Mohti
Dip. For. B. Sc. For.
M. Sc. Applied Rem. Sens./GIS (UPM)

Pegawai Penyelidik Kontrak
Contract Research Officers

Salleh Mat
B. Sc. Res. Econ. M.Sc. (UPM)

Khairul Najwan Ahmad Jahari
B. Sc. For (UPM)

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

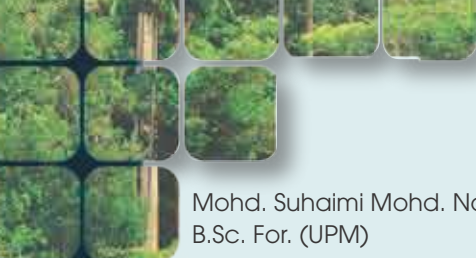
Syuharni Abdul Wahab
Dip. For., B. Sc. For. (UPM)

Nur Fadzliza Kamarulbahrin
B. Sc. For. (UPM)

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

Mohd. Aswad Ramlan
B.Sc. For. (UPM)





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

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. For. (UPM)

Program Hutan Bandar dan Rekreasi
Urban Forestry and Recreation Programme

Pengarah
Director

Dr. Noor Azlin Yahya
B. Sc. Biol. (Doane)
M. Sc. Res. Mgmt. & Policy (New York)
Ph. D. Recreation Management (UPM)

Pegawai Penyelidik
Research Officers

Dr. Elizabeth Phillip
B. Sc. Agric. (UPM)
Ph. D. Plant Physiology (UM)

Adnan Mohamad
B. Town & Country Plan. (UTM)
M. Sc. Lands. Ecl. Des. & Mgmt. (London)

Ahmad Azaruddin Mohd. Noor
B. Sc. Hort. (UPM)

Zalani Abd. Kadir
B. Lands. Des. (Washington)
(On study leave)

Ahmad Nazarudin Mohd. Roseli
B. Sc. Hort. (UPM)

Sreetheran Maruthaveeran
B. Sc. Cons. Bio. (UMS)
M. Sc. Trop. For. Mgmt. (UPM)

Kho Lip Khoon
B. Sc. Env. (UPM)
M. Sc. Soil Chem. (UNIMAS)

Pegawai Penyelidik Kontrak
Contract Research Officers

Nik Azyyati Abdul Kadir
Dip. For. (UPM)
B. Sc. For. (UPM)

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

Arkitek Landskap Kontrak
Contract Landscape Architect

Nik Adlin Nik Mohamed Sukri
B. Lands. Des. (UTM)

Pegawai Perancang Bandar dan Desa Kontrak
Contract Town Planning Officer

Mimi Zareena Md. Nor
B. Sc. Town & Reg. Plan. (UTM)

Penolong Pegawai Penyelidik
Assistant Research Officers

Mohd. Afendi Husin
Dip. Agric. (UPM)

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

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

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

Penolong Pegawai Perancang Bandar
Assistant Town Planning Officer

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

Siswazah Bantuan Penyelidikan
Graduate Research Assistantship

Roslina Nordin @ Mamat
B. Sc. For. (UPM)

BAHAGIAN PEMBANGUNAN PRODUK
PRODUCT DEVELOPMENT DIVISION

Pengarah Kanan
Senior Director

Dr. Hoi Why Kong AMN, FMSA
B. Sc. (Hons.), M. Sc. App. Sc. (UKM)
Ph. D. (Aston)

Program Kimia Kayu
Wood Chemistry Programme

Pengarah Kanan
Senior Director

Dr. Mohd. Nor Mohd. Yusoff
B. Sc. For. (Louisiana)
M. Sc. For. Prod. (Virginia)
Ph. D. (Manchester)

Pegawai Penyelidik
Research Officers

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

Salamah Selamat AMIC, MIQ
B. Sc. (Hons) (UKM)

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

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

Sharmiza Adnan
B. Chem. Eng. (Vanderbilt)
M. Sc. (UKM)

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

Dr. Ainun Zuriyati Mohamed @ Asa'ari
B. Sc. (Hons.), M. Sc. Wood, Paper and
Coating Tech. (USM)
Ph. D. (UKM)

Latifah Jasmani
B. Sc. (Hons.) (Manchester)
M. Sc. (UKM)

Mohamad Nasir Mat Arip AMIC
B. Sc. (Hons.) Chem. (UKM)
M. Sc. (UKM)

Mahanim Sarif @ Mohd. Ali
B. Eng. (Hons.), M. Sc. (USM)

Shaharuddin Hashim
B. Sc. Analytical Chem. (USM)

Rafidah Jalil
B. Eng. (Hons), M. Sc. Chem. Eng. (UKM)

Pegawai Penyelidik Kontrak
Contract Research Officers

Tumirah Khadiran
B. Sc., M. Sc. Chem. (UKM)

Penolong Pegawai Penyelidik
Assistant Research Officers

Zaitun Said
Dip. Wood Tech. (UiTM)

Azizi Abdul Jalil
Dip. Wood Tech. (UiTM)

Noraidah Subakin
Dip. Sc. (UiTM)
B. Sc. Mat. Sc. (UKM)
Dip. Wood Tech. (UiTM)

Program Pembinaan dan Perlindungan Kayu
Timber Construction and Protection Programme

Pengarah
Director

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

Pegawai Penyelidik
Research Officers

Hj. Mohd. Shukari Midon, AMN
B. Sc. Mech. Eng. (Strathclyde)

Dr. Gan Kee Seng
Dip. Mech. Eng. (UTM),
B. Sc. Mech. Eng.,
Ph. D. (Strathclyde)

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



Dr. Mohamad Omar Mohamad Khaidzir
Dip. Civil Eng. (UTM)
B. Sc. Civil Eng. (CBU Memphis)
M. Sc. (British Columbia)
Ph. D. (Sheffield)

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

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

Roszaini Kadir
Dip. Wood Tech. (UiTM)
B. Sc. For., M. Sc. (UPM)

Dr. Hamdan Husain
Dip. Arch. (UTM),
B.Sc. HBP, B. Arch. (USM),
Ph. D. (Wales)

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

Suffian Misran
B. Sc. (Hons.) (UPM),
M. Sc. (UPM)

Rafeadah Rusli
B. Sc. (Hons.) (USM),
M. Sc. (UPM)

Mohamad Jani Saad
B. Tech (Hons.) (USM),
M. Sc. (USM)

Maria Zura Mohd. Zain
B. E. Civil Eng. (Hons.) (USM)

Pegawai Penyelidik Kontrak
Contract Research Officers

Mohd. Jamil Abdul Wahab
B. E. Mech. Eng. (UM)

Siswazah Bantuan Penyelidikan
Graduate Research Assistantship

Noraswati Mohd Nor Rashid
B.Sc. (Hons) (UPM)

Penolong Pegawai Penyelidik
Assistant Research Officers

Habibah Mohamad
Dip. Ind. Chem. (UiTM)

Rozaida Latip
Dip. Wood Tech. (UiTM)

Nor Azian Mohd. Kasby
Dip. Civil Eng. (UTM)

Baharuddin Kamaruddin
Dip. Wood Tech. (UiTM)
B. Sc. Wood. Tech. (UPM)

Roszalli Mohd.

Program Pemprosesan dan Teknologi Kayu
Timber Processing and Technology Programme

Pengarah
Director

Dr. Tan Yu Eng
B. Sc. (Hons.) (UKM)
Ph. D. (Brighton)

Pegawai Penyelidik
Research Officers

Dr. Ani Sulaiman
B. Sc. (Hons.), M.Sc. (Wales)
Ph. D. (Reading)

Mohd. Arshad Saru
Dip. Mech. Eng.(UTM)
B. Eng. (Sunderland)

Lim Seng Choon PPN., AMP
Dip. Timb. Stud. (Bucks.)
M. Sc. (Wales)

Mohd. Tamizi Mustafa
Dip. Wood Tech. (UiTM)
B. Sc. For. (UPM)

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

Abdul Hamid Saleh
B. Ind. Design (UiTM)
B. Sc. (Hons) Fur. Tech. (UiTM)
M. Sc. Fur. Design Strength (UiTM)

Ong Chee Beng
B. Sc. (Hons) (UPM)
M.Sc. (UPM)

Khairul Awang
Dip. Plant Mgmt. (UiTM)
B. Sc. (Hons.) Fur. Tech. (UiTM)
M. Sc. WPC (USM)

Mohd Khairun Anwar Uyup
B. Sc. For., M. Sc. For. (UPM)

How Seok Sean
B. Sc. For. (UPM)
M. Sc. Inf. Tech. (UPM)

Sik Huei Shing
B. Sc. For. (UPM)

Pegawai Penyelidik Kontrak
Contract Research Officers

Choo Kheng Ten AMN
B. Sc. (Hons.) UM

Nur Hazami bt. Kamarul Zaman
B. Biotechnology (UIA)

Siswazah Bantuan Penyelidikan
Graduate Research Assistantship

Nordahlia bt. Abdullah Siam
B. Sc. (Botany) (UKM)

Penolong Pegawai Penyelidik
Assistant Research Officers

Zawawi Kassim
Dip. Sc.(UiTM)

Siti Rafidah Mahmud
Dip. Wood Tech. (UiTM)

Noor Nazreen Nasir
Dip. Elec. Eng. (UiTM)

Ahmad Ismail

Pembantu Teknik
Technical Assistant

Ya'akob Zahari

BAHAGIAN BIOTEKNOLOGI
BIOTECHNOLOGY DIVISION

Pengarah Kanan
Senior Director

Dr. Baskaran Krishnapillay
B. Sc. (Hons.) Agric., M. Sc.,
Ph.D. (UPM)

Program Hutan Ladang
Forest Plantation Programme

Pengarah
Director

Dr. Ab. Rasip Ab. Ghani
Dip. Agric. (UPM)
B. Sc., M. Sc. (Texas)
Ph. D. (UKM)

Pegawai Penyelidik
Research Officers

Dr. Lee Su See
B. Sc. (Hons.) (UM)
M. Sc. (UPM)
Ph. D. (Aberdeen)

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

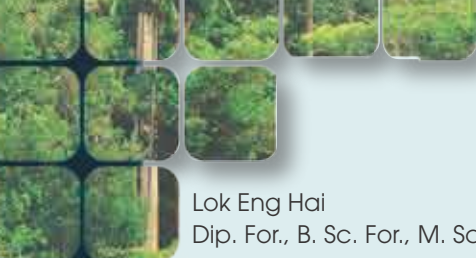
Dr. Ahmad Zuhaidi Yahya
Dip. For. (ITM/For. College, Kepong)
B. Sc. Res. Econ. (UPM)
M. Sc. For. (Aberdeen)
Ph. D. (Irish Int. Dublin)

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

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

Dr. Adzmi Yaacob
B. Sc. (UM)
M. Sc. (Kent)
Ph. D. (Wales)

Dr. Laurence G. Kirton
B. Sc. (Hons.) (USM)
Ph. D. (London)



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

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

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

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

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

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

Grace Tabitha Lim Wui Oi
B. Agric. Sc., M. Sc. (UPM)

Mohd. Farid Ahmad
B. Sc. For., M. Sc. (UPM)

Mohd. Ghazali Hassan
Dip. Agric., B. Sc. (UPM)
M.Sc. (UPM)

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

Patahayah Mansor
B. Sc. For. (UPM)

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

Shawn Cheng
B. Sc. Bio-Indus. (UPM)
M. Sc. (Imperial College)

Nada Badruddin
B. App. Sc. (Ento) (USM)

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

Pegawai Penyelidik Kontrak
Contract Research Officers

Rosazlin Abdullah
B. Sc. Food Tech.
M. Sc. For. (UPM)

Phon Chooi Khim
B. Sc. Applied Sc. (USM)

Shahlinney Lipeh
B. Sc. Biol. (Zoology),
M. Sc. Entomology (UKM)

Siswazah Bantuan Penyelidikan
Graduate Research Assistantship

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

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

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

Penolong Pegawai Penyelidik
Assistant Research Officers

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

Suhaimi Wan Chik
Dip. Agric. (UPM)

Amir Saiffuddin Kassim
Dip. Agric. (UPM)
Bac. Marketing (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)

Program Tumbuhan Ubatan
Medicinal Plants Programme

Pengarah
Director

Dr. Rasadah Mat Ali
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. Health Sc. (UKM)

Mohd. Shahidan Mohd. Arshad
B. Sc. (Hons.) (UM)

Zamree Md. Shah
Dip. Vet., B. Sc. Biomed. (Hons.) (UPM)
M. Sc. (UPM)

Chee Beng Jin
B. Sc. (Hons.) (UPM)
M. Sc. Animal & Plant Physiology (UPM)

Mary Khoo Gaik Hong
B. Sc. (Hons.) Bio. (UPM)
M. Sc. Physiol. (UPM)

Norhayati Abdullah
B. Sc. (Hons.) Chem. (UM)
M. Sc. (UM)

Mazura Pizar
B. Sc. Biomed. (Hons.),
M. Health Sc. (UKM)

Hada Masayu Ismail @ Dahlan
B. Sc. Eng. (Hons.) (UPM)

Saidatul Husni Saidin
B. Sc. Nutr. & Comm. Health (UPM)
M. Sc. Plant Syst. (UPM)

Noor Rasyila Mohamed Noor
B. Sc. Biotech. (UPM)
M. Sc. Gen. Eng. & Molec. Biol. (UPM)

Fauziah Abdullah
B. Sc. (Hons.) Chem. (UKM)
M. Sc. Chem. (UKM)

Pegawai Penyelidik Kontrak
Contract Research Officers

Mailina Jamil
B. Sc. (Hons.) Appl. Chem. (UiTM)

Pin Kar Yong
B. Chem. Eng. (Hons.) (UPM)

Fadzureena Jamaluddin
B. Sc. Biomedic. (Hons.) (UM)

Saiful Azmi Johari
B. App. Sc (Hons.) (USM)

Abdul Rashid Li
B. Sc. (Hons.) App. Chemistry (UiTM)

Penolong Pegawai Penyelidik
Assistant Research Officers

Abdull Rashih Ahmad

Mohd. Radzi Ahmad





Program Bioteknologi Hutan
Forest Biotechnology Programme

Pengarah
Director

Dr. Marzalina Mansor
B. Sc. (Hons.) (Carlton)
Ph. D. (UKM)

Pegawai Penyelidik
Research Officers

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

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 Mohamad
B. Sc. (Hons.), M. Sc. (UKM)
Ph. D. (Reading)

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

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

Asiah Osman
B. Sc. Biotech (UPM)
M. Sc. Conserv. Biol. (UKM)

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

Fadhilah Zainudin
B. Sc. Biotech. (UPM)
M. Sc. Conserv. Biol. (UKM)

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)

Norlia Basherudin
B. Sc. Biotech., M. Sc. (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 Vejayan a/I 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. Biochem (UPM)

Noraliza Alias
B. Sc. Biotech (UPM)

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

Pegawai Penyelidik Kontrak
Contract Research Officers

Dr. Saeid Reza Doust Jalali
B. Sc. (Hons.) Microbiol. (Delhi)
M. Sc. Biochem. (Manipal)
Ph. D. (UM)

Rozihawati Zahari
Dip. For. (UPM)
B. Sc. For. (UPM)

Rosilah Ab. Aziz
B.Sc. Biotech. (UMS)

Siti Suhaila Abdul Rahman
B. Sc. Biotech. (UPM)
M. Sc. Biotech. (UPM)

Besek Intan Zafina Basok
B. Sc. For., M. Sc. Info. Tech. (UPM)

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

Sun Wan Fong
B. Sc. Indus. Biol. (UTM)

Penolong Pegawai Penyelidik
Assistant Research Officers

Ang Khooon Cheng

Siswazah Bantuan Penyelidikan
Graduate Research Assistantship

Tnah Lee Hong
B. Sc. Indus. Biol. (UTM)

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

BAHAGIAN PENGURUSAN PENYELIDIKAN
RESEARCH MANAGEMENT DIVISION

Pengarah Kanan
Senior Director

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

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)

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

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

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

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

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

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

Pegawai Penyelidik Kontrak
Contract Research Officers

Roshamida Ruslan
B. Sc. (Hons.) Info. Sys. Mgmt. (UiTM)

PENERBITAN PUBLICATIONS

Pada tahun 2006, sebanyak 36 judul telah diterbitkan manakala 2 judul popular telah dicetak semula. Perinciannya dijadualkan di bawah:

In 2006, a total of 36 publications were produced while 2 popular titles were reprinted. The details are tabulated below:

| Jenis penerbitan <i>Type of publications</i> | Judul <i>Title</i> | Bil. <i>No.</i> |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Journal of Tropical Forest Science | JTFS Vol. 18(1-4) | 4 |
| FRIM Technical Information Handbook | Penghasilan Bahan Tanaman Meranti Tembaga (<i>Shorea leprosula</i>) Panduan Pengecaman dan Pencegahan Penyakit Pokok Sentang Establishment and Management of <i>Khaya ivorensis</i> Plantation Cultivation of Kenaf (<i>Hibiscus cannabinus</i>) on Sand Tailings | 4 |
| Siri Alam dan Rimba | Pembangunan Taman Alam Semula Jadi Untuk Pemerhatian Tumbuhan dan Haiwan di Kawasan Sekolah Tumbuhan Hiasan untuk Landskap | 2 |
| FRIM Reports | Effective Implementation of EIA on Forest Harvesting in Peninsular Malaysia | 1 |
| Timber Technology Bulletin | Timber of Sentang Identification and Utilization of Lesser-Known Commercial Timbers in Peninsular Malaysia 5: Balek Angin, Bayur Bukit, Bebaru and Beka Identification and Utilization of Lesser-Known Commercial Timbers in Peninsular Malaysia 6: Bungor, Chenderai, Dungun Paya and Gelam Identification and Utilization of Lesser-Known Commercial Timbers in Peninsular Malaysia 7: Hantu Duri, Jarum-Jarum, Jelutong Pipit and Kasah | 4 |
| Proceedings | Proceedings of the National Seminar on Agroforestry 2004: The Way Forward, 21 to 22 September 2004, FRIM The Conference on Best of Both Worlds: Environmental Education for Sustainable Development, 6 to 8 September 2005, Kuala Lumpur Proceedings of the Fourth National Seminar on Wood-Based Panel Products: Towards Meeting Global Challenges, 28 to 30 September 2004, Kuala Lumpur Proceedings of the 8 th Pacific Rim Bio-Based Composites symposium "Advances and Challenges in Biocomposites" 20 to 23 November 2006, Kuala Lumpur Harnessing Cures from Nature: Trends & Prospects. Proceedings of the Seminar on Medicinal and Aromatic Plants, 13 to 14 September 2005 | 5 |
| Annual Report | Laporan Tahunan 2005 | 1 |
| Research Report | 2005 Research Report | 1 |
| FRIM in Focus | March, June & September Issues | 3 |

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|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| Research Programme | FRIM's Research Programme of the Ninth Malaysia Plan (2006-2010) | 1 |
| Research Pamphlets | Plants of Krau | 1 |
| Tree Flora of Sabah & Sarawak | A Sarawak Gazetteer | 1 |
| Other Publications | Guidelines for Establishing a Nature Education Centre for Urban Areas dan Rhu Tapai, Terengganu. Kajian Sosio-Ekonomi Agroperhutanan di Air Tawar, Kelantan dan Rhu Tapai, Terengganu Kajian Sosio-Ekonomi Penanaman Tembakau di Kawasan Tanah Liat di Kedah, Perlis dan Kelantan Guidelines for Making Forest Management More Participatory and Effective Malaysia Plant Red List Guide for Contributor Common Edible Mushrooms of Orang Asli Communities in Peninsular Malaysia Highlights of FRIM's IRPA Projects 2005: Identifying Potential Commercial Collaborations Highlights of FRIM's Non-IRPA Projects: Project Evaluation Meeting, 4-5 July 2006, FRIM | 8 |
| Reprints | Tree Flora of Sabah and Sarawak Vol. 1 Tree Flora of Sabah and Sarawak Vol. 3 | 2 |

BUKU BOOKS

- AHMAD FAUZI, P., ISMAIL, A. & NAJIB LOFTY, A. Kajian sosio-ekonomi agroperhutanan di Air Tawar, Kelantan dan Rhu Tapai, Terengganu. FRIM publication, Kepong, Selangor. ISBN 983-2181-70-4
- AHMAD FAUZI, P., NAJIB LOFTY, A., MOHD. PARID, M., ROSDI, K. & ISMARIAH, A. Kajian sosio-ekonomi penanam tembakau di kawasan tanah liat di Kedah, Perlis dan Kelantan. FRIM publication, Kepong, Selangor. (KSE 01-06)
- AHMAD ZUHAIDI, Y., AB. RASIP, A.G., ROSDI, K., ZAINAL, T. & MOHD. PARID, M. Establishment and management of *Khaya ivorensis* plantation, FRIM Technical Information Handbook, No. 37, FRIM, 27 pp.
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- ANG, L.H. Cultivation of kenaf (*Hibiscus cannabinus*) on sand tailings. FRIM Technical Information Handbook No. 38. FRIM, 32 pp.
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- CHUA, L.S.L & SAW, L.G. Malaysian Plant Red Data Book. Guide to Contributions. Forest Research Institute Malaysia, Kepong. 28 pp
- CHUA, L.S.L. & L.G. SAW (Eds.). Conservation Malaysia Bulletin Issue No: 3
- CHUA, L.S.L. & SAW, L.G. Plants of Krau in Chung, R.C.K. (Ed.). FRIM Research Pamphlet No. 126. FRIM, Kepong. 227 pp
- CHUNG, R.C.K. & TAN, H.T.W. The Angiosperm Flora of Singapore: Erythroxylaceae. Singapore University Press, National University of Singapore, Singapore. 4 pp
- CHUNG, R.C.K. & THAI, S.K. Sumber hutan. Pp 33-52 in Lian, T.K.F. (Ed.). Profil Sumber Asli Malaysia. Kementerian Sumber Asli dan Alam Sekitar, Putrajaya.
- CHUNG, R.C.K. Nyssaceae. Pp 27-39 in Kiew, R., Chung, R.C.K., Saw, L.G. & Soepadmo, E. (Eds.). Guide to Preparing Manuscripts for the Flora of Peninsular Malaysia, FRIM
- FADZUREENA, J., RASADAH, M.A., KHOZIRAH, S ISRAF, D.A & LAJIS, N.H. Chemical studies and biological activities of *Vitex negundo*. Pp 111-116 in Fasihuddin, A, Zaini, A, Laily, D & Ikram, M.S. (Eds.). Malaysian Medicinal Plants-Chemistry and Biological Activity, Universiti Sarawak Malaysia, Kota Samarahan, Sarawak, 348 pp.
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- Establishment in Malaysia. 13 pp.
16. KANDASAMY, K.I. Pembiakan melalui kultur tisu. Pp. 34-48 in Aminah, H. *et al.* (Eds.). Penghasilan Bahan Tanaman Meranti Tembaga (*Shorea leprosula*). FRIM Technical Information Handbook No. 23
 17. KIEW, R., CHUNG, R.C.K., SAW, L.G. & SOEPADMO, E. (Eds.). Guide to Preparing Manuscripts for the Flora of Peninsular Malaysia. Forest Research Institute Malaysia, Kepong. 39 pp
 18. LEE, S.S. Malaysian Fungi. Siri Buku Alam Pak Cipan. Malaysian Nature Society, Kuala Lumpur. 40 p
 19. LEE, S.S., CHANG, Y.S. & NORASWATI, M.N.R. Common edible mushrooms of Orang Asli communities in Peninsular Malaysia. (Cendawan yang Biasanya Dimakan oleh Komuniti Orang Asli di Semenanjung Malaysia). FRIM, Kepong. 16 p
 20. LIM, H.F., WOON, W.C. & MOHD. PARID, M. The Orang Asli and ecotourism development in Cameron Highlands. Pp. 86-93 in Chan, N.W. (Ed.). Cameron Highlands: Issues & Challenges in Sustainable Development, School of Humanities, Universiti Sains Malaysia
 21. MOHD AFENDI, H., ADNAN, M., AZAHARI, M.Y., AHMAD AZARUDDIN, M.N. & AHMAD NAZARUDIN, M.R. Tumbuhan hiasan untuk landskap. Siri Alam dan Rimba No. 10, FRIM, Kepong, 112 pp
 22. MOHD. FARID, A., LEE, S.S. & PATAHAYAH, M. Panduan pencegahan dan pencegahan penyakit pokok Sentang. FRIM Technical Information Handbook No. 36. FRIM, Kepong. 41p
 23. MOHD. NOR, M.Y., KOH, M.P., SUFFIAN, M., WAN ASMA, I. & RAHIM, S. (Eds.). 2006. Proceedings of the Fourth National Seminar on Wood-based Panel Products: Towards meeting global challenges. 28 to 30 September 2004, Kuala Lumpur. FRIM, 139 pp.
 24. MOHIZAH, M., JULIA, S. & SOH, W.K. A Sarawak Gazetteer. In Soepadmo, E., Chung, R.C.K. & Saw, L.G. (Eds.). Sarawak Forestry Department, Kuching & FRIM, Kepong. 194 pp
 25. NOOR AZLIN, Y., ONG, T., SHANMUGARAJ, I.S., & CHONG, M.I. Guidelines for establishing a nature education centre for urban areas. FRIM, Kepong, 46 pp
 26. NOOR AZLIN, Y., PHILIP, E., & ONG, T. (Eds.). Proceeding of the Conference on Best of Both Worlds: Environmental Education for Sustainable Development. FRIM, Kepong, 100 pp
 27. NUR SUPARDI, M.N. Pasoh Research Center. Pp. 48.
 28. SAMSUDIN, M. Issues relating to reducing emissions from deforestation in developing countries and recommendations on any further process Submissions from Parties. FCCC/SBSTA/2006/MISC.5. Pp. 93-95
 29. SAW, L.G. Issues and challenges in forest biological diversity (Book chapter). In Abd. Rahman, M., Abdul Latif, A.Z., Sahilah, A.M., Rosliza, J., Lo, N.P. and Mohd. Shukor, N. (Eds.). Proceedings of Convention on biological diversity and international treaty on plant genetic resources for food and agriculture – Issues and Challenges in Malaysia. MARDI.
 30. SOEPADMO, E. & WONG, K.M. (Eds.). Compiled by SAW, L.G. & UMMUL NAZRAH, A.R. Tree Flora of Sabah and Sarawak, Volume 1

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1. ABD. RAHMAN, K. An overview on sustainable forest management in Peninsular Malaysia. Pp 1-9 in Priyadi, H., Gunarso and P. Kaninnen, M. (Eds.). Proceedings of International Workshop on Promoting Permanent Sample plots in Asia and the Pacific Region. 2 to 5 August, Bogor Indonesia
2. ABD. RAHMAN, K., NORSHAM, Y. & ELANGO, V. Plant introduction programme for Kepong Botanical Gardens. Pp. 84-85 in Ho, Y.F. and Sarifah, K.A. (Eds.). Highlights of FRIM's Non-IRPA Projects. Project Evaluation Meeting. 4 to 5 July, Kepong, FRIM
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KERTAS KERJA WORKING PAPERS

1. ABD. HAMID, S., ROSLAN, A., MOHD. DAHLAN, J., SHAKRI, M.S. & ZULKIFLI, A. Manufacturing process of furniture components using Laminated Veneer Oil Palm (LVOP). Paper presented at the Conference on Natural Resources in the Tropics: Development and commercialization of tropical natural resources. 6 to 8 June, Kuching, Sarawak, UNIMAS
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4. ABD. RAHIM, N. & NUR SUPARDI, M.N. Long-term ecological research in Pasoh: Collaborative research project between Malaysia & Japan. National Workshop on the Long-term Ecological Research. 10 to 12 July, Kepong, FRIM
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7. ABD. RAZAK, M.A., HASHIM, M.D., NAJIB LOTFY, A., MAHMUD, W., AHMAD FAUZI, P., AHMAD ZUHAIIDI, Y. & ROSDI, K. Agroforestry systems of planting timber and non-timber species in Peninsular Malaysia. Paper presented at the International Agroforestry Conference (IAC) 2006, Agroforestry: Harnessing The Benefits. 1 to 2 August, Pan Pacific, Kuala Lumpur, FRIM
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11. ADNAN, M., AMAT RAMSA, Y. & SREETHERAN, M. Urban forestry and arboriculture development in Malaysia. Paper presented at the Urban Forestry Conference: Managing Urban Green for Sustainable Cities. 6 to 8 June, Crown Princess Hotel, Kuala Lumpur
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19. AMAT RAMSA, Y., ADNAN, M., NILSSON, K., KHAIRULAZLAN, R. & SREETHERAN, M. Promoting physical activities and healthy lifestyle through urban planning and design: A case study of user needs of urban green spaces in Bandar Tun Razak, Kuala Lumpur. Paper presented at ASEM Second Symposium on Urban Forestry. 28 June to 1 July, Copenhagen
20. AMINAH, H. Pembinaan tampang pokok. Kursus Usahawan Tapak Semaian Komersial. Kementerian Kemajuan Luar Bandar dan Wilayah. 17 to 21 April, Kuala Lumpur, 8 pp.
21. AMINAH, H. Pembinaan tampang pokok. Notes of Kursus Tapak Semaian FRIM. 13 to 15 June, FRIM, Kepong, FRIM, 8 pp.
22. AMINAH, H. Pembinaan tampang spesies pokok hutan. Kursus Tapak Semaian dan Pembinaan Tampang bagi Renger Hutan Gred G17 dan Pengawas Hutan Gred G11. 18 to 22 September, Kepong, FRIM, ULP

23. ANG, L.H. & HO, W.M. Tree planting techniques of sand tailings and their potential applications to the sustainable management of ornamental tree plantings. Paper presented at the Urban Forestry Conference: Managing Urban Green for Sustainable Cities. 6 to 8 June, Crown Princess Hotel, Kuala Lumpur
24. ANI, S. Occurrence of biodeterioration agents in FRIM wood collection library. Paper presented at the National Conference on Agrobiodiversity, conservation and sustainable utilization, 6 to 8 November, Kuching, Sarawak.
25. ANI, S. Pith flecks occurrence in Malaysian wood species- Annonaceae. Paper presented at the Fifteenth Electron Microscopy Society Malaysia Scientific Conference. 4 to 6 December, Kuala Terengganu, Terengganu, KUKTEM
26. ANI, S; HOI, W.K & TAN, Y.E. Wood culture - A Malaysian perspective. Paper presented at the First Conference on wood culture around the globe, 17 to 20 February, Harbin, China
27. AZIAN, M., SHAMSUDIN, I. & ABDUL RAZAK, M.A. Pemulihan kawasan pantai berlumpur dengan spesies bakau dan spesies lain yang sesuai. Paper presented at Bengkel Kebangsaan Seismic and Tsunami Hazards and Risks in Malaysia. 24 to 25 April, Berjaya Times Square, Kuala Lumpur
28. BAGCHI, R., LAW, R., HENRYS, P., BROWN, P.E., BURSLEM, D., DIGGLE, P.J., GUNATILLEKE, C.V.S., GUNELITILLEKE, I., ABDUL RAHMAN, K. & NUR SUPARDI, M.N. The spatial structure of tropical tree populations: Untangling density dependence and habitat heterogeneity. Paper presented at the Annual Meeting of British Ecological Society. 1 to 7 September, UK
29. BALTZER, J.L., DAVIES, S.J., BUNYAVEJCHEWIN, S., ABDUL RAHMAN, K. & NUR SUPARDI, M.N. Determinants of geographic distributions in tropical trees: Comparisons between everwet and seasonal forests in Malaysia and Thailand. Paper presented at the Ecological Society of America meeting. 7 August, Memphis, USA
30. CHANG, L.Y., MOHD ALI, A.R., HASSAN, S.S. & ABU BAKAR, S. Identification of human neuronal cell protein responses to Nipah virus infection. Proceedings of the Joint Third AOHUPO and Fourth Structural Biology and Functional Genomics Conference. 4 to 7 December, National University of Singapore, Singapore
31. CHANG, Y.S. & ZAINON, A.S. Conservation efforts of medicinal and aromatic plants in Peninsular Malaysia. Paper presented at the Ninth International Congress on Ethnopharmacology. 22 to 26 August, Liyuan Resort, Nanning, China.
32. CHANG, Y.S., NORWATI, M., NOR AZAH, M.A., ABU SAID, A., NOR HASNIDA, H. & LOK, E.H. Research efforts on Gaharu-producing species in Malaysia. Paper presented at the Workshop on the Trade Dynamics of Agarwood in Malaysia. 1 to 2 March, FRIM, Kepong, TRAFFIC(Southeast Asia), FRIM
33. CHANG, Y.S., PHILIP, E., ZAINON, A.S. & RASADAH, M.A. Country report for the Development of Database of Medicinal Plants. Paper presented at the Workshop on Development of database and e-descriptors of medicinal plants in 12 Asian countries. 16 to 17 October, Corus Hotel, Kuala Lumpur
34. CHANG, Y.S., PHILIP, E., ZAINON, A.S. & RASADAH, M.A. Country report for the Development of Electronic Descriptors for Medicinal Plants. Paper presented at the Workshop on Development of database and e-descriptors of medicinal plants in 12 Asian countries. 16 to 17 October, Corus Hotel, Kuala Lumpur
35. CHEE B.J. Insulin releasing (insulinotropic) effect of local plant extracts on pancreatic beta cell lines. Paper presented at Malaysia-Novartis Proposed Biotechnology Initiative Working Group Discussions. 21 to 22 July, Mandarin Oriental Hotel, Kuala Lumpur
36. CHEE, B.J. & RASADAH, M.A. Hypoglycemic property of two pathogenic fungi species. Paper presented at the Twenty Second Annual Seminar of the Malaysian Natural Products Society: Beyond Medicinal Plants. In conjunction with the Fifth Asian Network of Research on Antidiabetic Plants (ANRAP) International Seminar themed Reality & Challenges in Antidiabetic Research, 8 to 10 November, Ciffel, Midvalley City, Kuala Lumpur, ANRAP, MNPS
37. CHEE, B.J. Wild Herbs: Cures from the forest. Paper presented at the Second Asian Camping Congress (2006): Tropical Rainforest: A Heritage to be Shared. 18 to 21 August, Casuarina Hotel, Perak.
38. CHONG, M.I. & NOOR AZLIN, Y. Willingness to pay for urban green areas of FRIM. Paper presented at the Urban Forestry Conference: Managing Urban Green for Sustainable Cities. 6 to 8 June, Crown Princess Hotel, Kuala Lumpur
39. CHUNG, R.C.K., SOEPADMO, E., SAW, L.G., KAMARUDIN, S. & SYAHRIR-FARIHAN, M.Z. Wild fruit plants of Peninsular Malaysia. A paper presented at the Project Evaluation Meeting (PEM), 4 to 5 July 2006, Forest Research Institute Malaysia, Kepong.
40. EFRANSJAH, E., GUNARSO, P., CHE HASHIM, H., SANTOSA, K.D. Consultative planning as a prerequisite for effective forest governance: Case studies of integrated management planning in Pahang, Malaysia and Malinau, Indonesia. Paper presented at the Workshop on Forest Governance and Decentralisation in Asia Pacific. 4 to 6 September, Yogyakarta, Indonesia. 13 pp.
41. EFRANSJAH, E., KHALI AZIZ, H., & ABDUL RAHIM, N. Integrated management plan of South East Pahang Peat Swamp Forest. Paper presented at the Mesyuarat Pegawai Perancang Bandar dan Desa. 14 to 15 September, Cherating, Pahang, 11 pp.
42. EFRANSJAH, E., KHALI AZIZ, H., ABDUL RAHIM, N., & CHE HASHIM, H. Integrated management plan for conservation and sustainable use of South-east Pahang Peat Swamp Forest, Malaysia. Paper presented at the International Symposium on Nature and Land Management of Tropical Peat land in South East Asia. 20 to 21 September, Bogor, Indonesia, 18 pp.
43. FARAH FAZWA, M.A, AB. RASIP, A.G., LOKMAL, N., NORAZAH, M.A., ABU SAID, A. & MOHAMAD, O. Pembentukan piawaian pengeluaran hasil minyak pati Limau purut (*Citrus hystrix*) menggunakan kaedah penyulingan air. Paper presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
44. FARAH FAZWA, M.A. & AB. RASIP, A.G. Notes on vegetative propagation. Paper presented at the Workshop on Tree and Herb Improvement. 6 to 8 December, Kepong, FRIM
45. FAUZIAH, C.I., SHAMSUDDIN, J., ZIN ZAWAWI, Z., ZAUZYAH, D., GOH, K.J., JALLOH, M.B., AHMED, O.H. & ROSAZLIN,

- A. (Eds.). Proceeding of the Soil Science Conference 2006: Strategies for Enhanced Soil Crop Quality. 18 to 20 April, Kuantan, Pahang, Malaysian Society of Soil Science, Kuala Lumpur.
46. GAN, K.S., SIM, H.C., LIM, S.C. & MOHD. JAMIL, A.W. Drying behaviour of selected mixed light hardwood. Paper presented in the Malaysian Science and Technology Congress 2006 (MSTC 2006). 18 to 20 September, Putra World Trade Centre, Kuala Lumpur
 47. GETHA, K. Selection, characterisation and evaluation of an antagonistic *Streptomyces sp.* for the control of Fusarium Wilt of banana. A paper presented at the UM Graduate Symposium. 1 to 2 June, Kuala Lumpur, UM
 48. GETHA, K., MASTURA, M. & BAZILAH, J. Nature vs nature: bioprospecting soil actinomycetes for antistaphylococcal agent. A paper presented at the MSA Golden Jubilee International Symposium on Public Understanding of Science & Technology (PUSAT 2006). 15 to 17 June, Corus Hotel, Kuala Lumpur
 49. GILL, S.K. & KHALI AZIZ, H. Conservation of indigenous knowledge on medicinal plants: The Asli Jakun experience in South-east Pahang Peat Swamp Forest. Paper presented at the Tenth Seminar on Medicinal and Aromatic Plants. 12 to 13 September, Kepong, FRIM, 15 pp.
 50. GILL, S.K., KHALI AZIZ, H., & ROSS, W.H. The application of indigenous knowledge in community-based sustainable livelihood ventures: A participatory model of the Asli Jakun of the South-east Pahang Peat Swamp Forest, Malaysia. Paper presented at the RC24 Session 16: Roundtable on Environment and Society at the Sixteenth International Sociological Association (ISA) World Congress of Sociology, South Africa. 29 July, 30 pp.
 51. GIMONA, A., ILLIAN, J., BURSLEM, D., ABDUL RAHMAN, K., NUR SUPARDI, M.N. & AHMAD, W.J.W. Species-environment associations in Pasoh Forest Reserve, Peninsular Malaysia. Paper presented at the Annual Meeting of British Ecological Society. 1 to 7 September, UK
 52. HAMDAN, H., ANI, S., BREESE, M.C. & ANWAR, M.K.U. Failure characteristics in *Gigantochloa scortechinii* bamboo associated with compressive stress. Paper presented at the Fifteenth Electron Microscopy Society Malaysia Scientific Conference. 4 to 6 December, Kuala Terengganu, Terengganu, KUKTEM
 53. HASHIM, M.N., AHMAD ZUHAI, Y., ROSDI, K. & AMINUDDIN, M. Conservation of biodiversity through agroforestry practices by rural communities in Kedah and Sabah. Paper presented at the National Conference on Agrobiodiversity, conservation and sustainable utilization, 6 to 8 November, Kuching, Sarawak.
 54. HASHIM, M.N., AB. RASIP, A.G. & AHMAD ZUHAI, Y. Plantation research at FRIM: The Way Forward. Paper presented in A Study Tour of Myanmar officials in Malaysia. 4 to 8 December, Kepong, FRIM
 55. HASHIM, M.N., ABD. RAZAK, O., ROSDI, K., AHMAD ZUHAI, Y. & AB. RASIP, A.G. The potential of Palas (*Licuala spinosa*) Palm as an understorey crop in Rubber Plantations in Malaysia. Paper presented at the International Agroforestry Conference (IAC) 2006, Agroforestry: Harnessing The Benefits. 1 to 2 August, Pan Pacific, Kuala Lumpur, FRIM
 56. HASHIM, MD. & AB. RASIP, A.G. An overview of forest plantation development and management in Malaysia. Paper presented at the Program Pengenalan Kepada Perhutanan Untuk Kakitangan Lantikan Baru, FRIM, 20 to 21 February, FRIM, Kepong
 57. HASNAH, B., ZULKHAIRI, A., FAUZIAH, O., MAZNAH, I., TAUFIK, H.M., SHARIDA, F., ZAMREE, M.S. & SHAHIDAN, M.A. Effects of *Tinospora crispa* on antioxidants status and atherosclerosis plaque formation in rabbits fed with high fat diet. Paper presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 58. HO, W.M., ADI FADZLY, A.K. & ANG, L.H. Effects of soil amendment on the growth of Durian (*Durio zibethinus*) and Petai (*Parkia speciosa*) on sand tailings of an ex-tin mine. Paper presented at the International Agroforestry Conference (IAC) 2006, Agroforestry: Harnessing The Benefits. 1 to 2 August, Pan Pacific, Kuala Lumpur, FRIM
 59. HO, W.M., LEE, D.K. & ANG, L.H. Greenhouse experiment on effects of lead and fertilizer on growth and gas exchange properties of Kenaf. Paper presented in the Malaysian Science and Technology Congress 2006 (MSTC 2006). 18 to 20 September, Putra World Trade Centre, Kuala Lumpur
 60. HUDA FARHANA, M.M., MOHD. PARID, M., LIM, H.F. The development of water recreation based area in Malaysia: The Case of temenggor Lake, Perak. Paper presented at the Conference on Natural Resources in the Tropics: Development and commercialization of tropical natural resources. 6 to 8 June, Kuching, Sarawak, UNIMAS
 61. ISMAIL, H., SHAMSUDIN, I., NUR HAJAR, Z.S. & SAMSUDIN, M. Public and private sector financing sustainable forest management in Malaysia: An investigation on innovative mechanisms. Paper presented at the FAO Inter-regional Workshop. 20 to 22 November, Chiang Mai, Thailand
 62. ISMARIAH, A. & NAJIDAH, I. Trend analysis of prices, production, consumption, and trade of tropical timber Products. Paper presented at the Conference on Natural Resources in the Tropics: Development and commercialization of tropical natural resources. 6 to 8 June, Kuching, Sarawak, UNIMAS
 63. ISMARIAH, A. & RAHIM, S. Economic feasibility of forest plantation thinning for wood composites. Paper presented at the Eighth Pacific Rim Bio-Based Composites Symposium: Advances and Challenges in Biocomposites. 20 to 23 November, Kuala Lumpur, FRIM
 64. JAYA, V. Application of proteomics in purifying bioactive proteins from snake venoms. Paper presented at Malaysia-Norvatis Proposed Biotechnology Initiative Working Group Discussions. 21 to 22 July, Mandarin Oriental Hotel, Kuala Lumpur
 65. JAYA, V., IBRAHIM, H. & OTHMAN, I. Studies on 2D-PAGE gel mapping of bioactive proteins and the neutralization effects of Semalu on five species of poisonous snake venom. A paper presented at Molecular Medicine Departmental Seminar Series. 12 May, Medical Faculty, University Malaya, UM
 66. JAYA, V., IBRAHIM, H. & OTHMAN, I. The application of proteomics technology in the identification of bioactive proteins of snake venoms. A paper presented at the International Symposium on Science and Technology. 6 February, UMS-GIST

67. KANDASAMY, K.I. Exploratory studies on soil microbes of the tropical rain forest; a collaborative project between the Forest Research Institute Malaysia (FRIM) and Nimura Genetic Solutions Sdn. Bhd. (NGS). In Ho, Y.F. and Sarifah, K.A. (Eds.). Highlights of FRIM's Non-IRPA Projects. Project Evaluation Meeting. 4 to 5 July, Kepong, FRIM
68. KANDASAMY, K.I. Plant Biotechnology: An overview. Paper presented at the Monash University Malaysia. 6 April, Monash University Malaysia.
69. KANDASAMY, K.I. Tissue culture of herbal plants. Paper presented at the Seminar on Community Involvement in Sustainable Bio-Resource and Biotechnology Utilisation. 4 to 7 September, IDS, Kota Kinabalu, Sabah
70. KHAIRUL, A., AB. RASIP, A.G., ONG, T.H., TAMIZI, M., MOHD. ZAKI, A. & ZAMANI, W.Y. Machining properties of *Khaya senegalensis* from the urban road-side tree. Paper presented at the Conference on Natural Resources in the Tropics: Development and commercialization of tropical natural resources. 6 to 8 June, Kuching, Sarawak, UNIMAS
71. KHALI AZIZ, H. Integrated database management system for monitoring of biodiversity in Peat Swamp Forest - A case study in Pahang. Paper presented at the National Training on Wetland Conservation and Sustainable Use in Malaysia. 27 to 29 June, Kepong, UNDP/GEF Funded Project MAL/99/G31, Wetland International and Forestry Training Unit, Forestry Department Headquarters Peninsular Malaysia, 10 pp.
72. KHALI AZIZ, H. Integrated management of Peat Swamp Forest in South East Pahang. Paper presented at the National Training on Wetland Conservation and Sustainable Use in Malaysia. 27 to 29 June, Kepong, UNDP/GEF Funded Project MAL/99/G31, Wetland International and Forestry Training Unit, Forestry Department Headquarters Peninsular Malaysia, 12 pp.
73. KHALI AZIZ, H. Integrated Management of Peat Swamp Forest in South-East Pahang to minimise Forest Fire Occurrence. Paper presented at the Seminar on Peat Swamp Forest Fire. 8 May, Kepong, FRIM, 12 pp.
74. KHO, L.K. Second national communication: greenhouse gas (GHG) inventory of land use, land-use change and forestry (LULUCF) sector in Malaysia. Paper presented at Second Consultative Workshop on GHG Inventory for LULUCF. 25 April, Kuala Lumpur
75. KHO, L.K., PHILIP, E. & ABDUL RAHIM, N. Environmental services provided by urban forests. Paper presented at the Urban Forestry Conference: Managing Urban Green for Sustainable Cities. 6 to 8 June, Crown Princess Hotel, Kuala Lumpur
76. KIRTON, L.G. & CHENG, S. Forest Plantation Entomology. In Rasip, A.G. (Ed.). Forest Plantation Research at the Forest Research Institute Malaysia. Paper presented to the Malaysian Forestry Research and Development Board (MFRDB).
77. KOH, M.P, ANG, T.P. & NOOR, E. MDF panels from bagasse, coconut fiber and waste paper. A preliminary study. Paper presented in the Malaysian Science and Technology Congress 2006 (MSTC 2006). 18 to 20 September, Putra World Trade Centre, Kuala Lumpur
78. KOH, M.P, PUAD, E. & MOHD. NOR, M.Y. Biomass energy in Malaysia: future directions in R&D. Paper presented at Seminar on Energy from Biomass 2006. 25 to 26 July, FRIM, Kepong, FRIM
79. KOH, M.P. & HOI, W.K. Opportunities and challenges of briquette industries in Malaysia and Southeast Asia. Paper presented at Seminar on Energy from Biomass 2006. 25 to 26 July, FRIM, Kepong, FRIM
80. LEE, S.L. Forest genetic resources, conservation and management in Malaysia - An update on activities, challenges and needs since APFORGEN inception in 2003. Country report presented to Asia Pacific Forest Genetic Resources Programme (APFORGEN), A country coordinator meeting. 15 to 16 April, Dehra dun, India
81. LEE, S.L. Molecular Marker techniques. Notes for workshop module for Hand-on Workshop on Molecular Marker Techniques, in conjunction with the National Seminar & Workshop on Forest Biotechnology. 4 to 7 December, Kepong, FRIM, 140 pp.
82. LEE, S.L. DNA fingerprinting using microsatellite markers. Paper presented at the National Seminar & Workshop on Forest Biotechnology. 4 to 7 December, Kepong, FRIM
83. LIM, G.T., SALOM, S., KIRTON, L.G. & KOK, L.T. Enhancing the potential of the weaver ant, *Oecophylla smaragdina*, as a biological control agent of the Mahogany shoot borer. Paper presented at the 2006 Annual Meeting of the Entomological Society of America. 10 to 13 December, Indianapolis, Indiana, USA
84. LIM, H. F., MOHD. PARID, M., CHANG, Y.S & WOON, W.C. Gaharu harvesting and trade in Peninsular Malaysia. Paper presented at the Conference on Natural Resources in the Tropics: Development and commercialization of tropical natural resources. 6 to 8 June, Kuching, Sarawak, UNIMAS
85. LIM, H.F. The involvement of local community in forest management planning in Malaysia. Paper presented at the Seminar on Bridging the Gap Between R&D Findings and Policy Makers in Forest Management Planning. 23 February, Kuala Lumpur, FRIM, UPM and DANIDA
86. LIM, H.F., MOHD PARID, M., CHANG, Y.S. & WOON, W.C. Social perspective on Gaharu harvesting and trade in Malaysia. Paper presented at the Workshop on the Trade Dynamics of Agarwood in Malaysia. 1 to 2 March, FRIM, Kepong, TRAFFIC(Southeast Asia), FRIM
87. LIM, H.F., MOHD. PARID, M. & WOON, W.C. Poverty in Malaysia and among the Orang Asli community. Paper presented at Seminar Kontemporari, Developing Malaysia: Current Issues & Global Challenges. 12 April, UiTM Kampus Seri Iskandar, Perak, UiTM
88. LOKMAL, N. & MOHD. ZAKI, A. Selection, establishment and maintenance of seed production area. Paper presented at the Workshop on Tree and Herb Improvement. 6 to 8 December, Kepong, FRIM
89. MAHMUDIN, S., MOHD. NOR, M.Y. & RUSHDAN, I. Secondary fibres. Paper presented at the Course on Pulp and Paper Technology. 11 to 14 September, Kepong, FRIM
90. MASTURA, M. Intergrasi komponen penyelidikan dalam pembangunan produk herba. Paper presented at Majlis Penyerahan Sampel: Program Peningkatan Kualiti Produk Herba. 7 December, Kepong, FRIM-MECD
91. MASTURA, M. Komponen Penyelidikan dalam Pembangunan Produk Herba. Paper presented at the Kursus Teknologi Herba. 8 to 12 May, Hotel Plaza, Kuala Lumpur, Kementerian Kemajuan Luar Bandar & Wilayah

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92. MASTURA, M. Pharmacodynamic and Proteomic assessments of potential phytochemical combinations for anti-multidrug resistant *Staphylococcus aureus* (MRSA) agents. Paper presented at Malaysia-Norvatis Proposed Biotechnology Initiative Working Group Discussions. 21 to 22 July, Mandarin Oriental Hotel, Kuala Lumpur
93. MASTURA, M., SAIFUL, A.J. & MAZURAH, M.I. Antistaphylococcal activities from *Cinnamomum zeylanicum* Blume. Paper presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
94. MELLING, L., SAYOK, A., UJO, L.J., RYUSUKE, H., OSAKI, M. & LIAM, J. Working paper Logan Bunut Peat Study - A preliminary report. Paper presented during Workshop on Vulnerability of Carbon Pools of Tropical Peatlands in Asia. 24 to 26 January, Pekan Baru, Riau, Sumatra, Indonesia
95. MOHAMAD NASIR, M.A. & SHAHARUDDIN, H. Report from Proficiency Testing Programme: Cycle 2 2005 and Cycle 1 2006. Paper presented in Workshop on Proficiency Testing Programme for CCA Wood Preservative & CCA Treated Wood. 18 December, FRIM
96. MOHAMAD OMAR, M.K. Bahan binaan daripada kayu dan bahan berasaskan kayu. Kursus Penggunaan Kayu Di dalam Binaan. Jabatan Perhutanan Brunei. 18 to 20 July, Bandar Sri Begawan, Brunei.
97. MOHAMAD OMAR, M.K. Stress grading of timber as a prerequisite for implementation of IBS and MC concept. Paper presented at the Workshop on Timber Application To Complement Modular Coordination (MC) And Industrialised Building System (IBS). 23 August, FRIM, Kepong
98. MOHAMAD OMAR, M.K. Timber as a construction material. The International Course On Integrated Housing Project Development, Malaysian Technical Corporation Programme. 11 August, Kuala Lumpur
99. MOHAMAD OMAR, M.K. Use of timber in construction and practical lab testings. Paper presented at the Building Construction and Maintenance Course for ASEAN countries. 3 May, Kuala Lumpur, IKRAM and MTCB
100. MOHD NOOR, M. & LOK, E.H. Experimental design. Paper presented at the Workshop on Tree and Herb Improvement. 6 to 8 December, Kepong, FRIM
101. MOHD. ILHAM, A., MARZALINA, M., ASIAH, O., NURHANAN, M.Y., GETHA, K., CHANG, L.Y., SITI SYARIFAH, M.M., NORHAYATI, I., LILI SAHIRA, H., NORALIZA, A., ANEE SURYANI, S., NOR DATIAKMA, M.A., RAFEDAH, A., & JAYA, V. An integrated proteomic approach to find new bioactive substances from Malaysia bioresources. A paper presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
102. MOHD. NOOR, M. & LOK, E.H. Statistics in tree breeding. Paper presented at the Workshop on Tree and Herb Improvement. 6 to 8 December, Kepong, FRIM
103. MOHD. PARID, M., LIM, H.F., HUDA FARHANA, M.M. Willingness to pay for protecting natural environments: The case of Pulau Redang Marine Park, Terengganu. Paper presented at the Conference on Natural Resources in the Tropics: Development and commercialization of tropical natural resources. 6 to 8 June, Kuching, Sarawak, UNIMAS
104. MOHD. ROSLI, H., NORLIA, B., NORWATI, M., NORIHAN, M.S. & SUHAIMI, N. Morphological and genomic studies of teak (*Tectona grandis*) floral meristem. Paper presented at the Third Biotech Colloquium. 17 to 18 April, Serdang, Faculty of Biotechnology and Biomolecular Sciences, University Putra Malaysia
105. MOHD. RUSLI, Y., AHMAD, S. & MOHD. PARID, M. Local economic benefits of ecotourism development in Malaysia: The Case of Redang Island Marine Park. Paper presented at the Global Issues and Challenges in Business and Economics Seminar. 13 to 15 December, Port Dickson, Negri Sembilan, FEP
106. MOHD. TAMIZI, M., ABD. LATIF, M., HAMDAN, H. & RAJA BARIZAN, R.S. Current scenario of rattan industry in Peninsular Malaysia. Paper presented at the ITTO/ ICBR/ INBAR International Workshop on Sustainable Development of the Global Rattan Sector. 23 to 27 July, Beijing, China
107. MOHD. ZAKI, A. Hybridization technique. Paper presented at the Workshop on Tree and Herb Improvement. 6 to 8 December, Kepong, FRIM
108. MOHD. ZAKI, A., LOKMAL, N. & FARAH FAZWA, M.A. Plus tree and herb selection. Paper presented at the Workshop on Tree and Herb Improvement. 6 to 8 December, Kepong, FRIM
109. MOSADEGHZAD, Z., AHMAD, I., DAIK, R., RAMLI, A., & JALALUDIN, Z. Preparation of sawdust/UPR composite based on Recycled PET. Paper presented at the First International Conference For Young Chemists (Format-CD). 24 to 27 May, Penang, USM
110. MUHAMMAD EZHAR, Y., SHUKOR, M.N & YUSUF, A. Bird survey in Kenong Rimba Park, Kuala Lipis, Pahang. Paper presented at the Kenong Rimba Park, Lipis Expedition Scientific Seminar. 12 to 13 June, M.S. Garden Hotel, Kuantan
111. MUHAMMAD EZHAR, Y., ZAKARIA, M. & SHUKOR, M.N. Habitat preference of babbler species (Timaliidae) composition in logged forest: A comparison of forest interior and edge. Paper presented at the Third Life Sciences Postgraduate Conference. 24 to 26 May, Pulau Pinang, USM
112. MUHAMMAD EZHAR., Y., MOHD. SUHAIMI, M.N., SHAMSUDIN, I. & AZAHAN, I. The development of forest fire indicators in degraded peat swamp Forest: A potential tool for management of wildlife protected areas. Paper presented at the National Seminar On Protected Areas: Biological Diversity Resources Of Taman Negara National Park, Malaysia, Lanchang, Pahang. 18 to 19 April, Department Of Wildlife And National Parks Peninsular Malaysia, Institute For Biological Diversity, UKM
113. 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. 5 to 16 June, Corus Hotel, Kuala Lumpur
114. NIK MUSAADAH, M., BEN-MAHMUD, B.M., KOHNER, E.M. & CHIBBER, R. The role of NADPH oxidase in glucose-induced apoptosis of retinal capillary pericytes in early diabetic retinopathy. Paper presented at the

- Fifth Asian Network of Research on Antidiabetic Plants (ANRAP) International Seminar themed Reality & Challenges in Antidiabetic Research, 8 to 10 November, Cititel, Midvalley City, Kuala Lumpur, ANRAP, MNPS
115. NILSSON, K., JENSEN, M.B., ADNAN, M., SREETHERAN, M. & AMAT RAMSA, Y. Urban greenways in Kuala Lumpur. Paper presented at ASEM Second Symposium on Urban Forestry. 28 June to 1 July, Copenhagen
 116. NOOR AZLIN, Y., CHONG, M.I., AZYATI, A.K. & ROSLINA, N. To assess the needs, benefits and effectiveness of environmental education for plant conservation. In Ho, Y.F. and Sarifah, K.A. (Eds.). Highlights of FRIM's Non-IRPA Projects. Project Evaluation Meeting. 4 to 5 July, Kepong, FRIM
 117. NOOR AZLIN, Y., CHONG, M.I., SREETHERAN, M. & NIK ADLIN, M.S. A forest recreation for urbanized population of Kuala Lumpur: Addressing environmental interpretation for groups with special needs. Paper presented at ASEM Second Symposium on Urban Forestry. 28 June to 1 July, Copenhagen
 118. NOOR AZLIN, Y., ONG, T., SHANMUGARAJ, I.S., AZYATI, A.K., MANOHAR, M. & AZMAN, A.R. Providing nature education opportunities for the urban population through nature education centres establishment. Paper presented at the Urban Forestry Conference: Managing Urban Green for Sustainable Cities. 6 to 8 June, Crown Princess Hotel, Kuala Lumpur
 119. NOR AZAH M.A. Pengekstrakan dan penyulingan tumbuhan herba. Paper presented at the Kursus Teknologi Herba. 8 to 12 May, Hotel Plaza, Kuala Lumpur, Kementerian Kemajuan Luar Bandar & Wilayah (KKLW)
 120. NOR AZAH, M.A. Potensi tumbuhan herba beraroma dalam penghasilan produk herba dan kosmetik. Dalam Seminar Pemasaran dan Majlis menandatangani Perjanjian kontrak pemasaran herba 2006 (CD). 29 ke 30 Mei, Shah Alam, Selangor
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POSTER POSTERS

1. ABD. HAMID, S, SAID, A., NORZATUL, D., ROSLAN, A. & ZULHAZMI, A. The effect of layers and combination of veneers on strength and physical properties of Laminated Veneer Oil Palm (LVOP). Poster presented at the Second International Conference on Environmentally-Compatible Forest Products. 20 to 22 September, Oporto, Portugal, Fernando Pessoa University
2. ABD. HAMID, S., HASHIM, W.S., ZAIHAN, J., PUAD, E., ZULKIFLI, A., AB JALIL, MOHAMAD ARSHAD, O. & SYARMIZA ANUAR, A.R. Furniture components from Laminated Veneer Oil Palm. Poster presented at Fifth Invention and Innovation Competition, Malaysia Technology Expo (MTE 2006), 23 to 25 February, PWTC, Kuala Lumpur
3. ABD. HAMID, S., SAID, A., HASLIZA, H., ROSLAN, A. & ZULHAZMI, A. Withdrawal and bending strength of dowel joint on Laminated Veneer Oil Palm (LVOP). Poster presented at the Second International Conference on Environmentally-Compatible Forest Products. 20 to 22 September, Oporto, Portugal, Fernando Pessoa University
4. ABD. HAMID, S., ZULHAZMI, A. & ROSLAN, A. Structural behavior of bending and lateral of "T"-Shaped joint made from LVOP and LVRW. Poster presented at the Second International Conference on Environmentally-Compatible Forest Products. 20 to 22 September, Oporto, Portugal, Fernando Pessoa University
5. ADNAN, M. & NIK ADLIN, N.M.S. Arbor-tracker and electronic tree tagging with RFID technology to keep track trees in FRIM's ground. Poster presented at the Urban Forestry Conference: Managing Urban Green for Sustainable Cities. 6 to 8 June, Crown Princess Hotel, Kuala Lumpur
6. ADZMI, Y., SUHAIMI, W.C. & AMIR SAAIFFUDIN, K. Some agroforestry species planted on BRIS soil in the east coast of P. Malaysia. Poster presented at the International Agroforestry Conference (IAC) 2006, Agroforestry: Harnessing The Benefits. 1 to 2 August, Pan Pacific, Kuala Lumpur, FRIM
7. AHMAD NAZARUDIN, M.R., NOOR AZLIN, Y. & SREETHERAN, M. The role of urban vegetation in enhancing living environment. Poster presented at the Urban Forestry Conference: Managing Urban Green for Sustainable Cities. 6 to 8 June, Crown Princess Hotel, Kuala Lumpur
8. AHMAD SHAKRI, M.S. & ZAIHAN, J. The possibility of using some Malaysian timbers for bentwood. Poster presented at Fifth Invention and Innovation Competition, Malaysia Technology Expo (MTE 2006), 23 to 25 February, PWTC, Kuala Lumpur
9. AINUN, Z.M.A., LATIFAH, J., SHARMIZA, A., MAHMUDIN, S., RUSHDAN, I. & MOHD. NOR, M.Y. Precipitated calcium carbonate in paper made from empty fruit bunch fibres. A poster presented in the Malaysian Science and Technology Congress 2006 (MSTC 2006). 18 to 20 September, Putra World Trade Centre, Kuala Lumpur
10. AMINAH, H. & ROSILAH, A.A. Vegetative propagation of Kacip Fatimah (*Labisia pumila*). Poster presented at the Second Women's Health & Asian Traditional Medicine (WHAT 2006) Conference. 28 to 30 July, PWTC, Kuala Lumpur
11. AMINAH, H., NAIMAH, C.L. & LOKMAL, N. Propagation of planting materials for ex situ conservation of Kacip

- Fatimah (*Labisia pumila*). Poster presented at the National Conference on Agrobiodiversity, conservation and sustainable utilization, 6 to 8 November, Kuching, Sarawak.
12. ANEE SURYANI, S., MOHD. ILHAM, A., IBRAHIM, J. & MOHD. HAFIDZ HADI, A. Effects of *Erythroxylum cuneatum* forma *cuneatum* (Miq.) Kurz on the withdrawal symptoms in morphine dependent rats. A poster presented at the Twenty Second Annual Seminar of the Malaysian Natural Products Society: Beyond Medicinal Plants. In conjunction with the Fifth Asian Network of Research on Antidiabetic Plants (ANRAP) International Seminar themed Reality & Challenges in Antidiabetic Research, 8 to 10 November, Cittel, Midvalley City, Kuala Lumpur, ANRAP, MNPS
 13. ANG, L.H., TANG, L.K., HO, W.M., HUI, T.F., WOON, V. & KRISHNAPILLAY, B. Comparison between effects of a slow-release fertilizer and organic fertilizer with NPK on the vegetative growths of two timber species. Paper presented at the International Agroforestry Conference (IAC) 2006, Agroforestry: Harnessing The Benefits. 1 to 2 August, Pan Pacific, Kuala Lumpur, FRIM
 14. ASIAH, O., NAKANOMYO, I., HASEBE, M., IWATSUKU, K., & WIKNESWARI, R. The rbcL gene sequences of *Labisia pumila* and *Calophyllum ferrugineum* var *oblongifolium*. A poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 15. AZURA, A., NORAZIAH, A.Y, NOR HASNIDA, H., KANDASAMY, K.I., MOHD. ILHAM, A., MOHD. RADZI, A., & MUHAMMED ISMAIL, A.K. High potential for anti-malaria compound from *Eurycoma longifolia* adventitious roots. Poster presented at Kerrie 06 (Research & Innovation UIA 2006), 5 to 6 December, UIA
 16. AZYYATI, A.K., AZAHARI, M.Y., NOOR AZLIN, Y. & ADNAN, M. Involving schools in urban greening development project. Poster presented at the Urban Forestry Conference: Managing Urban Green for Sustainable Cities. 6 to 8 June, Crown Princess Hotel, Kuala Lumpur
 17. AZYYATI, A.K., NOOR AZLIN, Y. & PHILIP, E. Involving school communities in planting trees & creating nature gardens. Poster presented at IFPRA EUROPEAN 2006: Trees as Living Beings, Essential in City, Annecy, 11 to 14 September
 18. CHANG, L.Y., MOHD. ALI, A.R., HASSAN, S.S., ABU BAKAR, S. Proteomics of Nipah virus-infected neuronal cells: association with the induction of apoptosis. A poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 19. CHANG, Y.S., LEE, S.S. & NORASWATI, M.N.R. Traditional knowledge about medicinal properties of mushrooms among Semai communities in Peninsular Malaysia. Poster presented at the Ninth International Congress on Ethnopharmacology. 22 to 26 August, Liyuan Resort, Nanning, China.
 20. CHEE, B.J, SHANSUL, K., & TAJUDDIN, A.M. A preliminary survey of medicinal plants of Malay communities in the Kuala Lipis - Merapoh area, Pahang. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 21. CHEE, B.J., SHAMSUL, K. & TAJUDDIN, A.M. A preliminary survey of medicinal plants of Malay communities at Kuala Lipis – Merapoh, Pahang. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006). 12 to 13 September, Kepong, FRIM
 22. FADHILAH, Z., NOR HASNIDA, H. & NEWBURY, J.H. Bacterial attachment and the effects of root exudates on Agrobacterium mediated transformation efficiency of *Arabidopsis thaliana*. Poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 23. FADZUREENA, J, RASADAH, M.A., KHOZIRAH, S. & LAJIS, N.H. Lignans from *Vitex negundo* L. stem. Poster presented at the Twenty Second Annual Seminar of the Malaysian Natural Products Society: Beyond Medicinal Plants. In conjunction with the Fifth Asian Network of Research on Antidiabetic Plants (ANRAP) International Seminar themed Reality & Challenges in Antidiabetic Research, 8 to 10 November, Cittel, Midvalley City, Kuala Lumpur, ANRAP, MNPS
 24. FADZUREENA, J., RASADAH, M.A., KHOZIRAH, S., ISRAF, D.A. & LAJIS, N.H. Chemical and biological activities of *Vitex negundo* L. (Verbenaceae). Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 25. FARAH FAZWA, M.A, AB. RASIP, A.G., LOKMAL, N., NOR AZAH, M.A., ABU SAID, A. & MOHAMAD, O. Pembentukan pawaian pengeluaran hasil minyak pati Limau Purut (*Citrus hystrix*) menggunakan kaedah penyulingan air. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 26. FARAH FAZWA, M.A., LOKMAL, N., MOHD. ZAKI, A., MOHD. NOOR, M. & AB. RASIP, A.G. Integrating Limau Purut (*Citrus hystrix*) with Tongkat Ali (*Eurycoma longifolia*) in FRIM's sub station, Maran, Pahang Darul Makmur. Poster presented at the International Agroforestry Conference (IAC) 2006, Agroforestry: Harnessing The Benefits. 1 to 2 August, Pan Pacific, Kuala Lumpur, FRIM
 27. FAUZIAH, A. & LING, S.K. Isolation and identification of chemical constituents from the fruits of *Morinda citrifolia* L. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 28. FAUZIAH, A., ABDULL RASHIH, A., & LING, S. K. High performance Liquid chromatography fingerprinting of *Morinda citrifolia* L. fruits. Poster presented at the Twenty Second Annual Seminar of the Malaysian Natural Products Society: Beyond Medicinal Plants. In conjunction with the Fifth Asian Network of Research on Antidiabetic Plants (ANRAP) International Seminar themed Reality & Challenges in Antidiabetic Research, 8 to 10 November, Cittel, Midvalley City, Kuala Lumpur, ANRAP, MNPS
 29. GAN, K.S., LIM, S.C. and MOHD JAMIL, A.W. Assessment of the variation in basic wood density of three rubber clones. Poster presented in the Malaysian Science and Technology Congress 2006 (MSTC 2006). 18 to 20 September, Putra World Trade Centre, Kuala Lumpur
 30. GAN, K.S., MOKHTARUD-DIN, H., MOHD. ZAWAWI, Y. & ROSZAINI, K. Laboratory assessment of fumigants on

- selected timber pests. Poster presented in the Malaysian Science and Technology Congress 2006 (MSTC 2006). 18 to 20 September, Putra World Trade Centre, Kuala Lumpur
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 32. GETHA, K. & MOHD. ILHAM, A. Isolation of soil Actinomycetes as potential biocontrol agent for plant diseases. A poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 33. HAMIDAH, M., EZZAWANIS, A.T. & CHUA, L.S.L. Mapping of threatened dipterocarps trees: Conservation of *Hopea subalata* in Kanching Forest Reserve. A poster presented at the Thirteenth ESRI South Asia User Conference 2006. 6 to 8 October, Sheraton Subang Hotel and Towers, Petaling Jaya
 34. HASHIM, M.N., ROSDI, K., AHMAD ZUHAI, Y. & ZAINOL, A. Occurrence of naturally grown medicinal herbs and trees at SPL Mata Ayer, Perlis. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 35. HASHIM, W.S., PUAD, E., ZAIHAN, J. & RAHIM, S. The manufacture of plywood from Oil Palm Trunk: A practical practices Poster presented at the Eighth Pacific Rim Bio-Based Composites Symposium: Advances and Challenges in Biocomposites. 20 to 23 November, Kuala Lumpur, FRIM
 36. HASHIM, W.S., ZAIHAN, J., PUAD, E., MOHD DAHLAN, J. & CHUAH, K.K., Non structural laminated veneer lumber from oil palm trunk. Poster presented at Fifth Invention and Innovation Competition, Malaysia Technology Expo (MTE 2006), 23 to 25 February, PWTC, Kuala Lumpur
 37. IBRAHIM, H., AZIZ, A.N., SYAMSIR, D.R., MASTURA, M. & AWANG, K. Essential oils and biological activities of *Zingiber* species (Zingiberaceae). Poster presented at the Twenty Second Annual Seminar of the Malaysian Natural Products Society: Beyond Medicinal Plants. In conjunction with the Fifth Asian Network of Research on Antidiabetic Plants (ANRAP) International Seminar themed Reality & Challenges in Antidiabetic Research, 8 to 10 November, Cititel, Midvalley City, Kuala Lumpur, ANRAP, MNPS
 38. JAYA, V., IBRAHIM, H. & OTHMAN, I. Eliminating vertical streaks to characterize proteins of high abundance. A poster presented at 2nd Eftan Proteomics User Meeting, 8 February, IOI Marriott, Putrajaya
 39. JAYA, V., IBRAHIM, H. & OTHMAN, I. Evaluation of plants potentially useful in the treatment of Hepatitis B infection. A poster presented at the Twenty Second Annual Seminar of the Malaysian Natural Products Society: Beyond Medicinal Plants. In conjunction with the Fifth Asian Network of Research on Antidiabetic Plants (ANRAP) International Seminar themed Reality & Challenges in Antidiabetic Research, 8 to 10 November, Cititel, Midvalley City, Kuala Lumpur, ANRAP, MNPS
 40. JAYA, V., IBRAHIM, H. & OTHMAN, I. Experimental evidence supporting the traditional use of plants in treatment of snakebite and Hepatitis B infection. A poster presented at 'Pameran Hari Peladang, Peternak dan Nelayan peringkat Negeri Sabah 2006'. 27 to 30 July, Tanjung Lipat, Kota Kinabalu
 41. JAYA, V., IBRAHIM, H. & OTHMAN, I. MALDI-TOF MS identification of snake venom protein at 2-DE region prominent with vertical streaks. A poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 42. KHOO, M., TAN, H.P., NUZIAH, H., & LING, S.K. Phytochemical and cytotoxicity evaluation of selected species of medicinal plant. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 43. LATIFAH, J., AINUN, Z.M.A., SHARMIZA, A., MAHMUDIN, S., RUSHDAN, I. & MOHD. NOR, M.Y. Cationic starch in *Acacia* hybrid kraft pulps: Effect of stirring. A poster presented in the Malaysian Science and Technology Congress 2006 (MSTC 2006). 18 to 20 September, Putra World Trade Centre, Kuala Lumpur
 44. LEE, C.T., LEE, S.L., FARIDAH, Q.Z., SIRAJ, S.S. & NG, K.K.S. Cross-species amplification of *Koompassia malaccensis* (Leguminosae) microsatellites in selected leguminous timber species. Poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 45. LILI SAHIRA, H., CHANG, L.Y., MOHD. ILHAM, A., RAFEDAH, A., ASIAH, O. SITI SYARIFAH, M.M., NORHAYATI, I., NURHANAN, M.Y., HAFIDZ, H.A. Proteomic analysis of selected varieties of *Centella asiatica* Linn.(pegaga). A poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 46. LILI SAHIRA, H., SITI SYARIFAH, M.M., ASIAH, O., MOHD. ILHAM, A, NURHANAN, M.Y., NORHAYATI, I., CHANG, L.Y. Malaysian rainforest as a source of phytotherapy for cancer cure. A poster presented at the Second Women's Health & Asian Traditional Medicine (WHAT 2006) Conference. 28 to 30 July, PWTC, Kuala Lumpur
 47. LIM, A.L., CHUNG, R.C.K., NOR-AINA, A. & YONG, C.R. Leaf epidermal micromorphology of some selected Tiliaceae. A poster presented at the University of Malaya Research, Inventions and Innovations Expo 2006. 18 to 20 July, Kuala Lumpur, UM
 48. LING, S.K., ABDULL RASHIH, A. & SALBIAH, M. A comparative study of *Phyllagathis rotundifolia* and *Phyllagathis griffithii* by HPLC fingerprint analysis. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 49. LING, S.K., ABDULL RASHIH, A. & SALBIAH, M. High performance liquid chromatographic fingerprinting of flavonoids in *Chromolaena odorata*. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 50. LING, S.K., ABDULL RASHIH, A. & YEAP, C.S. Iridoids and flavonoids of *Vitex negundo*-Detection using high performance liquid chromatographic technique. Poster presented at the Twenty Second Annual Seminar


- of the Malaysian Natural Products Society: Beyond Medicinal Plants. In conjunction with the Fifth Asian Network of Research on Antidiabetic Plants (ANRAP) International Seminar themed Reality & Challenges in Antidiabetic Research, 8 to 10 November, Cititell, Midvalley City, Kuala Lumpur, ANRAP, MNPS
51. LOKMAL, N., AMINAH, H., MOHD. ZAKI, A., FARAH FAZWA, M.A., SHARMIZI, I & SUHAIMI, W.C. *Ex-situ* conservation and planting of Tongkat Ali at SPL Maran, Pahang: handling and management of wildings. Poster presented at the National Conference on Agrobiodiversity, conservation and sustainable utilization, 6 to 8 November, Kuching, Sarawak.
 52. LOKMAL, N., MOHD. ZAKI, A., FARAH FAZWA, M.A. & SUHAIMI, W.C. Ex-situ Conservation and Planting of Tongkat Ali at SPL Maran, Pahang. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 53. MAILINA, J., NOR AZAH, M.A., ONG, B.K., ABU SAID, A., MOHD. FARIDZ, Z., AHMAD HAFIZ, H., SITI ASHA, A.B. & IBRAHIM, J. TPA-induced mouse ear oedema inhibitory activity of selected Zingiberaceae species. Poster presented at the Fourth International Symposium on the Family Zingiberaceae. 3 to 6 July, Singapore.
 54. MOHD NOOR, M., FARAH FAZWA, M.A., BAKAR, A.R. & MOHD. ZAKI, A. Potential of integrating Lemon grass (*Cymbopogon citratus*) in inter row or vacant space in forest plantation. Poster presented at the International Agroforestry Conference (IAC) 2006, Agroforestry: Harnessing The Benefits. 1 to 2 August, Pan Pacific, Kuala Lumpur, FRIM
 55. MOHD. AFENDI, H., AZRINA, Y. & ADNAN. M. Nature-like tropical rainforest landscape in urban setting. Poster presented at the Urban Forestry Conference: Managing Urban Green for Sustainable Cities. 6 to 8 June, Crown Princess Hotel, Kuala Lumpur
 56. MOHD. RADZI, A., ONG, B.K., MOHD. ILHAM, A., & MOHD. HAFIDZ, H.A. Pembangunan kaedah penilaian kawalan mutu minuman kopi Tongkat Ali berasaskan penanda kimia Eurycomanone. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 57. MOHD. SUHAIMI, M.N., MUHAMMAD EZHAR, Y., SHAMSUDIN, I. & AZAHAN, I. Development of forest fire indicators: A tool for monitoring fire management in degraded peatland areas in Peninsular Malaysia. Poster presented at the National Seminar On Protected Areas: Biological Diversity Resources Of Taman Negara National Park, Malaysia, Lanchang, Pahang. 18 to 19 April, Department Of Wildlife And National Parks Peninsular Malaysia, Institute For Biological Diversity, UKM
 58. NADA, B., KIRTON, L.G. & NORMA-RASHID, Y. Diversity, distribution and abundance of fireflies along the Kuala Selangor River. Poster presented at the University of Malaya Research, Inventions and Innovations Expo 2006. 18 to 20 July, Kuala Lumpur, UM
 59. NG, C.H., LEE, S.L., MARIA, M., NORWATI, M., MAHANI, M. & NG, K.K.S. Estimation of DNA C-value for *Shorea curtisii*, *Hopea bilitonensis* and *Neobalanocarpus heimii*. A poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 60. NG, C.H., LEE, S.L., NG, K.K.S. & NORWATI, M. Cost-effective internal size standard for automated microsatellite genotyping. A poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 61. NG, C.H., NORWATI, M., LEE, S.L., NG, K.K.S., ABD. RASIP, A.G., KANDASAMY, K.I. & WICKNESWARI, R. Genetic linkage maps of *Acacia* hybrids (*A. mangium* x *A. auriculiformis*): Preliminary results. A poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 62. NG, K.K.S., LEE, S.L., TSUMURA, Y. & NG, C.H. Development of EST-SSRs from *Shorea leprosula* (Dipterocarpaceae): A preliminary result. A poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 63. NOR AZAH, M.A., MAILINA, J., ABU SAID, A., ABD. MAJID, J., MOHD. FARIDZ, Z. & NOR HADIANI, I. Comparison of the leaf essential oils of *Citrus hystrix* obtained by two different distillation techniques. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 64. NOR DATIAKMA, M.A., NORALIZA, A., KHAZAAI, H., HAMZAH, M.S., SAEID REZA, D.J., MASTURA, M., ARUNA, M.S., MARZALINA, M. Anti-multi-drug resistance *Staphylococcus aureus* (MRSA): Evaluation on herbal extracts. A poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 65. NOR DATIAKMA, M.A., NORALIZA, A., KHAZAAI, H., HAMZAH, M.S., SAEID REZA, D.J., MASTURA, M., ARUNA, M.S., MARZALINA, M. Determination of anti-multi drug resistance *Staphylococcus aureus* (MRSA) activity on *Macaranga gigantea* (Rchb.f. & Zoll.) Muell. Arg. A poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 66. NOR HADIANI, I., ABD. RASHID, L., FARIDAHANIM, M.J., & KHADIJAH, A. Phytochemical Study on *Meigynia virgata* (Annonaceae). Poster presented at the Twelfth Asian Symposium on Medicinal Plants, Spices and other Natural Products (ASOMPS XII). 13 to 18 November, University of Andalas, Sumatera, Indonesia.
 67. NOR HADIANI, I., DZULSUHAIMI, D., ABD. RASHID, L., & FARIDAHANIM, M.J. Anti-diabetic of *Leucaena leucocephala* ethanolic extract on alloxan-Induced diabetic rats. Poster presented at the Twenty Second Annual Seminar of the Malaysian Natural Products Society: Beyond Medicinal Plants. In conjunction with the Fifth Asian Network of Research on Antidiabetic Plants (ANRAP) International Seminar themed Reality &

- Challenges in Antidiabetic Research, 8 to 10 November, Cititel, Midvalley City, Kuala Lumpur, ANRAP, MNPS
68. NOR HASNIDA, H., KANDASAMY, K.I., ROHANI, A., SUN, W.F. & ROSILAH, A.A. Effects of 6-Benzylaminopurine (BAP) on shoot multiplication of *Aquilaria hirta* (Chandan). Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 69. NOR HASNIDA, H., ROHANI, A., KANDASAMY, K.I., SUN, W.F., ROSILAH, A.A., FADHILAH, Z. & MARZALINA, M. Micropropagation of *Aquilaria hirta* (Chandan) for plantation purposes. Poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 70. NOR HAYATI, A., MAZURA, M.P., LING, S.K., ONG, B.K., ZAINON, A.S. & SITI ASHA, A.B. Anti-inflammatory property of *Prismatomeris malayana* Ridley. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 71. NOR HAYATI, A., MAZURA, M.P., LING, S.K., ONG, B.K., ZAINON, A.S. & SITI ASHA, A.B. Bioassay guided fractionation and isolation of anti-inflammatory compound from *Prismatomeris malayana* Ridley. Poster presented at the Twenty Second Annual Seminar of the Malaysian Natural Products Society: Beyond Medicinal Plants. In conjunction with the Fifth Asian Network of Research on Antidiabetic Plants (ANRAP) International Seminar themed Reality & Challenges in Antidiabetic Research, 8 to 10 November, Cititel, Midvalley City, Kuala Lumpur, ANRAP, MNPS
 72. NORHAYATI, I., MOHD. ILHAM, A., ASIAH, O. SITI SYARIFAH, M.M., LILI SAHIRA, H., CHANG, L.Y., HAFIDZ, H.A. Bioassay guided fractionation of active plant extract against breast cancer cells using SEPBOX 2D-250. A poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 73. NORLIA B., NORWATI, M., NORWATI, A., MARZALINA, M. & MOHD. ROSLI, H. Studies on molecular and environmental effects of Teak floral initiation. Poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 74. NUZIAH, H. & RASADAH, M.A. Chemical analysis of *Melastoma malabathricum* L. Poster presented at the Twenty Second Annual Seminar of the Malaysian Natural Products Society: Beyond Medicinal Plants. In conjunction with the Fifth Asian Network of Research on Antidiabetic Plants (ANRAP) International Seminar themed Reality & Challenges in Antidiabetic Research, 8 to 10 November, Cititel, Midvalley City, Kuala Lumpur, ANRAP, MNPS
 75. NUZIAH, H., NAILINA, K.V., KHOO, M.G. H., SITI ASHA, A.B. & LING, S.K. Thin layer chromatography densitometry and cytotoxic evaluation of six *Piper* species. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 76. ONG, B.K., RASADAH, M.A., AHMAD HAFIZ, H., NIK YASMIN, N.Y & NUZIAH, H. Evaluation of anti-inflammatory activity in *Momordica charantia* L. using experimental animal model bioassay. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 77. PATAHAYAH, M., & ZAKARIYA, A. Human activities: A threat to urban trees. Poster presented at the Urban Forestry Conference: Managing Urban Green for Sustainable Cities. 6 to 8 June, Crown Princess Hotel, Kuala Lumpur
 78. RAJA BARIZAN, R.S. & MOHD. ASWAD, R. Improvement techniques of collecting and handling Chengal wildings for ease of handling and for better survival. Poster presented at the Indigenous Biological Research for National Development Conference. 5 to 6 December, Putrajaya, UKM
 79. ROHANA S., VIMALA, S., MOHD. ILHAM, A., ABDULL RASHIH, A., JULIZA, M., STUART, S., & LOH, K.K Product development from pink guava leaves and mangosteen skin standardized extracts. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 80. ROSAZLIN, A., WAN RASIDAH, K., ROZITA, A., WAN ASMA, I. & KELVIN, Y. The potential of processed sawdust charcoal as soil regulator. Poster presented at Seminar on Energy from Biomass 2006. 25 to 26 July, FRIM, Kepong, FRIM
 81. ROSENANI, A.B., WAN ASMA, I. & WAN RASIDAH, K. Conversion of EFB into mulch mat for establishment of forest species on sandy soil. Poster presented at the Seventeenth International Invention Innovation Industrial Design & Technology Exhibition 2006 (ITEX 2006). 19 to 21 July, KL Convention Centre, Kuala Lumpur
 82. ROSENANI, A.B., WAN ASMA, I. & WAN RASIDAH, K. Conversion of EFB into mulch mat. Poster presented at Malaysian Agriculture & Horticulture Exhibition (MAHA). 21 to 27 November, Serdang, Selangor
 83. ROSILAH, A.A., AMINAH, H., & BESEK INTAN ZARAFINA, B. Effect of commercial hormones on *ex-vitro* rooting of tissue culture derived plants of *Aquilaria malaccensis*. Poster presented in Trends in Biotechnology III. 4 to 6 September, Marriot, Putrajaya
 84. ROSILAH, A.A., SUN, W.F., KANDASAMY, K.I., NOR HASNIDA, H., FADHILAH, Z. & YAP, J.W. *In vitro* propagation of Misai Kucing (*Orthosiphon stamineus*). Poster presented at the Biotechnology Symposium III: Modernizing Agriculture through Molecular Biology. 29 November to 1 December, UMS
 85. ROSILAH, A.A., SUN, W.F., KANDASAMY, K.I., NOR HASNIDA, H., FADHILAH, Z. & YAP, J.W. *In vitro* propagation of Senduduk (*Melastoma malabathricum*) through microcuttings. Poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 86. ROTINA, D., NOOR AZLIN, Y. & SREETHERAN, M. Malaysian tree planting campaign: An effort to green the nature. Poster presented at IFPRA EUROPEAN 2006: Trees as Living Beings, Essential in City, Annecy, 11 to 14

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87. ROZITA, A., WAN RASIDAH, K., ROSAZLIN, A., MOHD. GHAZALI, H., LOKMAL, N. Growth performance of Serai wangi at two different locations. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 88. RUSEA, G., PHOON, S.N. & WENDY, Y.S.Y. Malaysian limestones orchids status: Diversity, threat and conservation. A poster presented at the Pameran Reka Cipta, Penyelidikan dan Inovasi (PRPI) UPM 2006. 22 to 24 August, UPM
 89. SAIDATUL HUSNI, S., NOR AZAH, M.A., MAILINA, J., ABD. MAJID, J. & MOHD. FARIDZ, Z. Cosmetic formulation studies using selected plant extracts. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 90. SAIDATUL HUSNI, S., NOR AZAH, M.A., UMI KALSOM, Y., MOHD. SHAHIDAN, M.A., MAILINA, J., FAUZIAH, A., NIK YASMIN, N.Y. & MOHD. FARIDZ, Z. Utilisation of *Morinda citrifolia* extracts in personal care products. Poster presented at the Twenty Second Annual Seminar of the Malaysian Natural Products Society: Beyond Medicinal Plants. In conjunction with the Fifth Asian Network of Research on Antidiabetic Plants (ANRAP) International Seminar themed Reality & Challenges in Antidiabetic Research, 8 to 10 November, Cititel, Midvalley City, Kuala Lumpur, ANRAP, MNPS
 91. SAIFULAZRY, S., PARIDAH, M.T. & MOHAMAD JANI, S. Strength and glue bond degradations of MDF and particleboard after being exposed to different environmental condition. A poster presented at the Eighth Pacific Rim Bio-Based Composites Symposium: Advances and Challenges in Biocomposites. 20 to 23 November, Kuala Lumpur, FRIM
 92. SALBIAH, M., NUZIAH, H. & LING, S.K. Chromatographic fingerprint of *Calophyllum inophyllum* by HPTLC densitometry. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 93. SAM, Y.Y., SAW, L.G. & IBRAHIM, H. Distribution of *Scaphochlamys*. A poster presented at the Fourth International Symposium on the Family Zingiberaceae. 3 to 6 July, Singapore.
 94. SITI SYARIFAH, M.M., ASIAH, O., MOHD. ILHAM, A., CHANG, L.Y., LILI SAHIRA, H., NORHAYATI, I., NURHANAN, M.Y. In search of active plant extract for anti-proliferative effects on human breast cancer cell lines. A poster presented at the National Seminar & Workshop on Forest Biotechnology: Biotechnology-Policy, R&D and funding issues towards resource conservation and generation of wealth from tropical rainforest. 4 to 7 December, Kepong, FRIM
 95. SREETHERAN, M., ROTINA, D. & NOOR AZLIN, Y. The green lungs of Kuala Lumpur: Providing open spaces within development. Poster presented at IFPRA EUROPEAN 2006: Trees as Living Beings, Essential in City, Annecy, 11 to 14 September
 96. SUN, W.F., KANDASAMY, K.I., YAP, J.W., ROSILAH, A.A. & RAJA BARIZAN, R.S. Preliminary study on propagation of *Neobalanocarpus heimii* (Chengal) using tissue culture techniques. Poster presented at the Biotechnology Symposium III: Modernizing Agriculture through Molecular Biology. 29 November to 1 December, UMS
 97. TASNIM, G., SAM, Y.Y. & TSAN, F.Y. The growth performance of a potential ornamental Begonia. A poster presented at the Conference on Natural Resources in the Tropics: Development and commercialization of tropical natural resources. 6 to 8 June, Kuching, Sarawak, UNIMAS
 98. THI, B.K., RAJA BARIZAN, R.S. & WICKNESWARI, R. Male and female inflorescences of *Calamus manan* Miq. in plantation. Pp. 515-518 in Lee, S.S. and Lim, H.F. (Eds.). Proceedings of the Conference on Forestry and Forest Products Research 2005 (CFFPR 2005): Investment for Sustainable Heritage and Wealth. 22 to 24 November 2005, Pan Pacific, Kuala Lumpur, FRIM
 99. ZAIHAN, J., PUAD, E., HASHIM, W.S., NOR AZIAN, M.K., HAFIZAN, J., MOHD. SHAHIDAN, H. & MOHAMAD, A. Development of computerized temperature and pressure monitoring system for fire resistance test. Poster presented at Fifth Invention and Innovation Competition, Malaysia Technology Expo (MTE 2006), 23 to 25 February, PWTC, Kuala Lumpur
 100. ZAMREE, M.S., HADA MASAYU, I., NOOR RASYILA, M.N., ABDUL RASHIH, A., SHAHIDAN, M.A., ONG, B.K., FAIZAL, K. & RASADAH, M.A. Hydroxycitric acid content in *Garcinia atroviridis* (Asam gelugor) fruits collected from different sites. Poster presented at the Tenth Seminar on Aromatic and Medicinal plants (2006): Plants, Man and Health-Past, Present and Future. 12 to 13 September, Kepong, FRIM
 101. ZARIDAH, M.Z, NOR AZAH, M.A, ABDUL MAJID, J., ABU SAID, A., MOHD. FARIDZ, Z. & ROHANI, A. Larvicidal activity of selected monoterpene components against *Aedes aegypti* L. Poster presented at the Forty Second Annual Scientific Seminar of the Malaysian Society of Parasitology and Tropical Medicine. 1 to 2 March, Ipoh, Perak, MSPTM
 102. ZARIDAH, M.Z, NOR AZAH, M.A, ABDUL MAJID, J., ABU SAID, A., MOHD. FARIDZ, Z. & ROHANI, A. Repellency activity of selected monoterpene components against *Aedes aegypti* L. Poster presented at the Second ASEAN Congress of Tropical Medicine and Parasitology. 21 to 23 May, Bandung, Indonesia.
 103. ZUNOLIZA, A., ZHARI, I. & RASADAH, M.A. Determination of total polyphenolic, flavonoids and tannins in *Ficus* spp. Poster presented at the Twenty Second Annual Seminar of the Malaysian Natural Products Society: Beyond Medicinal Plants. In conjunction with the Fifth Asian Network of Research on Antidiabetic Plants (ANRAP) International Seminar themed Reality & Challenges in Antidiabetic Research, 8 to 10 November, Cititel, Midvalley City, Kuala Lumpur, ANRAP, MNPS

ARTIKEL ARTICLES

1. AZYYATI, A.K. & NOOR AZLIN, Y. Nature awareness through the five senses. FRIM in Focus. September 2006. Pp. 3-4
2. CHANG, Y.S. Food for thought - Fungi focus. FRIM in Focus. March 2006. Pp. 5-6.
3. CHEE, B.J. Rawat diabetes gunakan tumbuhan tempatan, Utusan Malaysia, 23 Januari 2006, Muka surat 11

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4. CHEE, B.J. Tumbuh-tumbuhan ubatan tropika sumber agen antidiabetik. Dewan Kosmik, Disember 2006, pp. 24-25
 5. CHONG, M.I. Effectiveness of environmental education: Research and development. FRIM in Focus. September 2006. Pp. 2 & 8
 6. GAN, K.S. & LIM, S.C. Natural durability classifications of Malaysian Timbers - published classifications from two experimental sites. MWPA Newsletter 2:12-14
 7. GAN, K.S., LIM, S.C. & MOHD JAMIL, A.W. Moisture meter measurement - along or across wood grain? MWPA Newsletter 1(22):12-14
 8. ISMAIL, P. & SYUHARNI, A.W. FRIM formulates PSF harvesting regime. The PSF Project Newsletter - LEAF (Issue 5 July 2006)
 9. KANDASAMY, K.I. Biotech corner. Terra garden's Living taste: The newsletter for outdoor living. Terra Garden Sdn. Bhd. Malaysia. P 11
 10. LIM, S.C. & GAN K.S. Identification and utilization of lesser-known commercial timbers in Peninsular Malaysia 7: Hantu Duri, Jarum-Jarum, Jelutong Pipit and Kasah. Timber Technology Bulletin No 41. 6pp
 11. LIM, S.C. & GAN, K.S. Identification and utilization of lesser-known commercial timbers in Peninsular Malaysia 6: Bungor, Chenderai, Dungun Paya and Gelam. Timber Technology Bulletin No 40. 7pp.
 12. LIM, S.C. & GAN, K.S. Identification and utilization of lesser-known commercial timbers in Peninsular Malaysia 5: Balek Angin, Bayur Bukit, Bebatu and Beka. Timber Technology Bulletin No 39. 6pp.
 13. LIM, S.C. & GAN, K.S. Timber of *Acacia mangium*. MWPA Newsletter 3 (24):12-14.
 14. LIM, S.C., GAN, K.S. & KHAIRUL, A. Timber of Sentang. Timber Technology Bulletin No 38. 8pp.
 15. LING, S.K. Phytochemical and fingerprint libraries-Tools for future research. Symbiosis. Nov 2005-Jan 2006, p. 8
 16. NOORSIHA, A. Where is Gunung Aais and what is there. Conservation Malaysia Bulletin 3:3-4
 17. NOR AZAH, M.A. Harnessing biodiversity for cosmeceutical uses. Symbiosis Nov 2005-Jan 2006 Issue, pp. 18-20
 18. NORSHAM, Y. Specialist herpetofauna a good sign. Conservation Malaysia Bulletin 2:2
 19. PHOON, S.N. & RUSEA, G. Jewels of Padawan. Conservation Malaysia Bulletin 3:2
 20. ROSLINA, N. & NOOR AZLIN, Y. Environmental interpretation in recreational areas. FRIM in Focus. September 2006. Pp. 5-7
 21. SAM, Y.Y. Saving a highly endangered begonia. Conservation Malaysia Bulletin 3:12
 22. SHARMIZA, A. Sepetang bersama-sama penaung PUSPANITA NRE. FRIM in Focus. September 2006. FRIM
 23. TAN, S.A. Forest canopy gap detection using QuickBird Satellite Imagery. Bulletin GIS 2/2006
 24. ZAIHAN, J. Ujian daya ketahanan Api, FRIM. Artikel yang diterbitkan dalam Ruangan Sains – Mega. 10 May, Utusan Malaysia, pp. 20-21
 25. ZAINON, A.S. & CHANG, Y.S. Ethnobotanic Garden. FRIM in Focus. March 2006. Pp. 8-9.
 26. ZAMREE, M.S. & MOHD. SHAHIDAN, M.A. Biotechnology: Natural Weapon in Combating Fat. Symbiosis, October 2006, p. 17

TESIS **THESES**

1. AINUN, Z.M.A. Penambahan poliakrilamida di dalam penyediaan kertas magnet lumen berpengisi. Ph.D. Thesis. UKM.
2. GETHA, K. Selection, characterisation and evaluation of an antagonistic *Streptomyces* sp. for the control of Fusarium Wilt of banana. Ph.D. Thesis, UM, 366 pp
3. JAYA, V. Studies on 2d-page gel mapping of bioactive proteins and the neutralization effects of Semalu (*Mimosa pudica* L.) on 5 species of poisonous snake venom. Ph.D. Thesis, UM, 371 pp
4. JAYANTHI, N. Development of efficient experimental strategies for the cryopreservation of problematic topical rain forest tree germplasm. Ph.D. Thesis. University of Abertay Dundee.
5. NIK MUSAADAH, M. NADPH oxidase versus mitochondria-derived ROS in glucose-induced apoptosis of pericytes in early diabetic retinopathy. Ph.D. Thesis, King's College London, University of London
6. SHARMIZA, A. Prarawatan proses pulpulpaan kayu kasar berkimia (CMP) ke atas *Endospermum malaccense*. M.Sc. Thesis. UKM. 147 pp.
7. WAN ASMA, I. Optimization of mulch mat production from oil palm empty fruit bunches and its effects on growth performance of *Acacia* hybrid on sandy tailings. Ph.D. Thesis. UPM, 269 pp.

DANA PENYELIDIKAN DAN PEMBANGUNAN FUNDING FOR RESEARCH AND DEVELOPMENT

Pada 2006, 38 projek R&D berjaya memperoleh dana Science Fund, iaitu pembiayaan penyelidikan daripada Kementerian Sains, Teknologi dan Inovasi (MOSTI) sebanyak RM3.6 juta. Sejumlah RM300,000 lagi diterima untuk kos pengurusan projek, menjadikan jumlah yang diterima daripada MOSTI ialah RM6.6 juta.

Sementara itu, jumlah dana Geran Penyelidikan FRIM (sebelum ini dikenali sebagai Geran Penyelidik Muda FRIM) menerima pembiayaan sebanyak RM400,000.

Dana-dana lain yang diterima termasuklah daripada ITTO yang membiayai empat projek penyelidikan berjumlah USD1.5 juta. Projek tersebut ialah:

- Conservation of Biological Diversity through Sustainable Forestry Management Practices
- Improving Utilisation and Value Adding of Plantation Timbers from Sustainable Sources in Malaysia
- Strengthening National Capacity and Regional Collaboration for Sustainable Use of Forest Genetic Resources in Tropical Asia
- A Comprehensive Information System for Sustainability of the Wooded Furniture Industry in Malaysia.

In 2006, 38 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 FRIM Research Grant (previously known as Young Scientist Grant) amounted to RM400,000.

Other funds received included ITTO from which FRIM successfully secured funding for four projects worth about USD1.5 million. The four projects were

- *Conservation of Biological Diversity through Sustainable Forestry Management Practices*
- *Improving Utilisation and Value Adding of Plantation Timbers from Sustainable Sources in Malaysia*
- *Strengthening National Capacity and Regional Collaboration for Sustainable Use of Forest Genetic Resources in Tropical Asia*
- *A Comprehensive Information System for Sustainability of the Wooded Furniture Industry in Malaysia.*

DANA E-SCIENCE E-SCIENCE FUND

| Bil | Nama Projek dan Ketua Projek <i>Project Title and 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. 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 |

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| 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 <i>Acacia</i> 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 | Radio frequency-Vacuum drying of timber for enhanced property. Dr. Gan Kee Seng |
| 17 | Enhancement of aesthetic value of Malaysian oak by homogeneity colour. 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 dimensional 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 |
| 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. Getha R. Krishnasamy |
| 31 | Identification of anti-inflammatory compound(s) from <i>Prismatomeris malayana</i> ; a preliminary study towards drug development and commercialisation. Norhayati binti Abdullah |
| 32 | Development of delayed floral gene constructs of <i>Tectona grandis</i> for superior planting materials. 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 |

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| 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 |

GERAN PENYELIDIKAN FRIM
FRIM RESEARCH GRANT

| Bil. No. | Nama Projek dan Ketua Projek Project Title and Project Leader |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Roosting ecology and conservation of urban-dwelling bats in FRIM campus, Malaysia. 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. Maryanna 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 rosa-sinensis</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. Wan Asma Ibrahim. |
| 10 | Effect of lumen loading on the properties of paper made from empty fruit bunch fibres. Ainun Zuriyati Mohamed @ Asa'ari. |
| 11 | Penentuan kehadiran gen gus dan cry1A(b) di dalam DNA genomik pokok Jati kimerik. Norwati Adnan. |
| 12 | DNA fingerprinting database of Chengal towards forensic DNA testing in forestry. Lee Soon Leong. |
| 13 | Chemical standardisation 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>). Norlia Basherudin. |
| 17 | Taxonomy study and antimicrobial activity of selected Polyporales. Noraswati Mohd Nor Rashid. |
| 18 | Generation and analysis of expressed sequence tags (ESTs) derived from inner bark of <i>Shorea leprosula</i> (Dipterocarpaceae). Kevin Ng. |
| 19 | Developing best value performance indicators to evaluate green spaces: A case study of selected urban parks of Kuala Lumpur. Sreetheran Maruthaveeran. |
| 20 | Estimation of DNA C -value for Dipterocarps. Ng Chin Hong. |

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| 21 | Micropropagation of <i>Phyllagathis rotundifolia</i> (tapak gajah) using tissue culture techniques. Sun Wan Fong. |
| 22 | Development of synchronised suspension cell cultures of Kacip Fatimah (<i>Labisia potheria</i>) for use in somatic embryogenesis and secondary metabolite production. Kodi Isparan Kandasamy. |
| 23 | Development of chemical and biosensors for permethrin quantification. Mohamad Nasir Mat Arip. |
| 24 | Effect of fertilizer and mulch on growth of <i>Orthosiphon stamineus</i> . Rosazlin Abdullah. |
| 25 | Modified wood fibres for wood polymer composite production. Rafeadah Rusli. |
| 26 | <i>In vitro</i> propagation of <i>Begonia rajah</i> . Rosilah Ab Aziz. |
| 27 | <i>In vitro</i> propagation of <i>Aquilaria hirta</i> , an endangered species. Nor Hasnida Hassan. |
| 28 | Screening for anti-Multidrug Resistance <i>Staphylococcus aureus</i> (MRSA) agent candidate (s). Nor Datiakma Mat Amin. |
| 29 | Phytochemical study in P1 for anti MRSA activity. Noraliza Alias. |
| 30 | Proteomic analysis of breast cancer cell proteins expressed in response to active plants CfPR-110-1 and CfPR-114-1. Chang Li Yen. |
| 31 | Response of <i>Khaya ivorensis</i> seedlings to macronutrient deficiencies in sand culture. V. Jeyanny. |
| 32 | Protein map of herbal plant extract. Dr Saeid Reza Doust Jalali. |
| 33 | Mating system of Kempas (<i>Koompassia malaccensis</i>) menggunakan penanda mikrosatelit. Lee Chai Ting. |
| 34 | Development of pellet from laminated oil palm veneer (LOPV). Khairul Awang/TTC |
| 35 | Financial assessment of the integrated planting of Misai Kucing, Pegaga and Bunga Melur. Huda Farhana Mohd Muslim. |
| 36 | Phytoremediation of sand tailings using kenaf. Ho Wai Mun. |
| 37 | Kajian transformasi gen cry dalam mangga harum manis. Dr Ab. Rasip Ab.Ghani |
| 38 | Kajian status nutrien tanaman jati (<i>Tectona grandis</i>) di atas jenis tanah berbeza di Perlis. Adi Fadzly Hj. Abdul Khalid. |
| 39 | Feasibility study on the processing and utilization of kenaf for medium density fiberboard production. Mohd Jani Saad. |
| 40 | Assessment of wood structural damage by bio-deterioration agents on FRIM wood collections. Dr Ani Sulaiman |
| 41 | Commercialisation of natural antioxidant and skin whitening standardized extracts (nase and nasse) for cosmeceutical and neutraceutical product development. Vimala Subramaniam |