



# LAPORAN TAHUNAN MFRDB FRIM MFRDB FRIM ANNUAL REPORT 2010

- Anugerah Brandlaureate
- Anugerah Buku Negara
- Anugerah Penyumbang Kecemerlangan Kanak-Kanak APECPT
- Anugerah Kecemerlangan Makmal IKM



Institut Penyelidikan Perhutanan Malaysia  
*Forest Research Institute Malaysia*



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



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

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

**LAPORAN PENERUSI**  
**CHAIRPERSON'S REPORT**



**YB PN/MDM HAJAH NANCY HJ SHUKRI**  
**KMN, AMN**  
**PENERUSI/CHAIRPERSON**  
**MFRDB**

Memandangkan ini merupakan laporan pertama saya selaku Pengerusi Lembaga Penyelidikan dan Pembangunan Perhutanan Malaysia (MFRDB) di dalam Laporan Tahunan MFRDB dan Institut Penyelidikan Perhutanan Malaysia (FRIM) saya ingin memulakan laporan ini dengan beberapa ucapan tahniah serta penghargaan.

Pertamanya, saya ingin mengucapkan tahniah serta berbilang-banyak terima kasih kepada mantan Pengerusi, Y Bhg Datuk Suboh Mohd Yassin di atas kepimpinan yang cemerlang dan boleh diteladani di sepanjang tempoh perkhidmatan beliau. Bersama-sama dengan Ahli-ahli Lembaga, saya percaya anda semua bersetuju bahawa beliau telah berjaya membawa FRIM ke puncak kegemilangan dalam penyelidikan perhutanan dan keluaran hutan. Sumbangan, kesetiaan dan kegigihan beliau selaku Pengerusi Lembaga sangat dirasai dan dihargai oleh semua ahli Lembaga dan penjawat awam FRIM. Kami mengucapkan setinggi-tinggi terima kasih di atas sumbangan Y Bhg Datuk Suboh.

Sebelum saya meneruskan lagi laporan ini, izinkan saya untuk menyampaikan setinggi-tinggi tahniah kepada semua penjawat awam FRIM. Selamat menyambut Ulang Tahun ke-25 FRIM! Saya juga ingin mengambil kesempatan ini untuk menyatakan bahawa saya rasa sangat bertuah kerana dapat bekerja bersama-sama pemimpin yang berwawasan seperti Ketua Pengarah FRIM, Y Bhg Dato' Dr Abd Latif Mohmod, pihak pengurusan yang berdedikasi serta para penyelidik yang berinovatif. Walaupun dengan rendah diri saya menerima pelantikan selaku Pengerusi MFRDB yang keenam (dan Pengerusi wanita yang pertama), saya juga rasa tercabar untuk meneruskan legasi yang telah diukir oleh pengerusi-pengerusi terdahulu.

### **Ulasan Prestasi**

Pada 2010, ahli-ahli Lembaga bukan sahaja terus menyokong FRIM yang memasuki era perubahan, penerbitan hasil-hasil penyelidikan, ujian makmal dan seumpamanya, malah juga ke arah komersialisasi penemuan-penemuan penyelidikan, perlindungan ke atas hak harta intelek dan ilmu pengetahuan, dan inovasi. Untuk menggalak dan membantu penyelidik melindungi hak harta intelek, Lembaga telah melantik enam ejen paten sebagai penasihat dan jururunding dalam proses permohonan paten seperti pra-pemfailan, carian novelty, pendaftaran dan cap dagang. Jururunding komersialisasi turut dilantik bagi membantu FRIM dalam usahanya menggalakkan komersialisasi.

Penyelidikan akan terus menjadi teras aktiviti di institut ini, dan pada 2010, FRIM telah berjaya memperoleh peruntukan sebanyak RM87.8 juta daripada pelbagai pihak untuk tujuan operasi, projek-projek penyelidikan dan pembangunan (R&D) serta pembangunan fizikal. Ini termasuklah geran untuk projek-projek *ScienceFund* di bawah Kementerian Sains, Teknologi dan Inovasi (MOSTI). Sejumlah 53 projek telah ditamatkan pada 2010. Selaras dengan usaha-usaha mengadakan kerjasama penyelidikan, Lembaga telah menyaksikan sejumlah 21 memorandum persefahaman/perjanjian dengan pelbagai agensi pada 2010 termasuk empat yang berkaitan dengan penanaman, pengusahaan dan pemrosesan produk-produk herba.

Since this is my first message in the Forest Research Institute Malaysia (FRIM) Annual Report as the Malaysian Forest Research and Development Board Chairperson, I would like to begin with a few congratulatory words and appreciation.

Firstly, I would like to congratulate and thank the outgoing Chairman, Y Bhg Dato' Suboh Mohd Yassin, for his excellent and exemplary leadership during his tenure. Together with the Board members, I believe you will all agree with me that he had continued to make headways for FRIM in the field of forestry and forest product research. His contribution, dedication and perseverance in his years as the Board Chairman are felt and appreciated by fellow Board members and FRIM staff. Our heartfelt thanks to Y Bhg Dato' Suboh.

Before I go on, let me convey my heartiest congratulations to all FRIM staff on the completion of FRIM's 25 vibrant, productive and fruitful years. Happy Silver Anniversary! Before I proceed to highlight the achievements of FRIM in the year 2010, I would also like to take this opportunity to say that I feel deeply honoured for being able to work alongside a visionary leader such as FRIM Director General Y Bhg Dato' Dr Abd Latif Mohmod, the dedicated management and innovative researchers. Although I am humbled to be appointed as the sixth (and first lady) MFRDB Chairperson, I am also challenged to continue a legacy so well burnished, left by my predecessors.

### **Performance Review**

In 2010, the Board members continued to support FRIM as it ventured into an era of changes, beyond research publications, laboratory testing and such, but also into commercialization of research findings, intellectual property and knowledge protection, and innovation. To encourage and assist researchers in protecting their intellectual property rights, the Board has appointed six patent agents to provide advice and consultation in patenting processes such as pre-filing, novelty search, registration and trademarks. A commercialization consultant was also appointed to assist in giving FRIM a boost in its commercialization endeavours.

Research will always be the core business of the institute, and in 2010, FRIM was approved a total of RM87.8 million for its operations, research and development (R&D) and physical development projects from various funding avenues. This included grants awarded to 96 research projects from the ScienceFund under the Ministry of Science, Technology and Innovation (MOSTI). A total of 53 projects had since been completed by the year end. In keeping with the spirit of collaboration and teamwork, the Board had witnessed a total of 21 Memoranda of Understanding/Agreements with various agencies in the year 2010 including four which are related to the planting, harvesting and processing of herbal products.

The funds were well spent as FRIM continued to produce relevant findings for the industry and stakeholders. Among the major research activities undertaken is one close to the heart of FRIM—a collective accounting of all things living and non-living within FRIM's campus including trees, living creatures, carbon stocks, soil and water quality. It was a simple, yet significant exercise considering the availability of in-house

Dana tersebut telah dibelanjakan dengan begitu baik sekali dan telah menghasilkan pelbagai penemuan yang relevan dengan kehendak industri dan pihak-pihak yang berkepentingan. Antara aktiviti utama penyelidikan yang dijalankan ialah tentang sesuatu yang begitu dekat di hati FRIM—pengumpulan maklumat bilangan aset hidup dan aset bukan-hidup di dalam kampus FRIM termasuklah pokok, hidupan, stok karbon, tanah dan kualiti air. Walaupun kelihatan mudah, namun dianggap signifikan jika mengambil kira kepakaran yang sedia ada di FRIM. Penemuan tersebut telah diterbitkan di dalam buku “Laporan Inventori Dirian Kampus FRIM” dan “FRIM Tapak Warisan Semula Jadi” yang telah memenangi Anugerah Buku Negara bagi Kategori Buku Teknikal Terbaik pada 16 Disember. Antara penerbitan penting yang lain termasuklah Siri *Flora of Peninsular Malaysia* tentang pokok paku-pakis, likofit, dan biji benih serta buku *Malaysia Plant RED List*.

Beberapa penemuan penyelidikan turut diiktiraf kerana mempunyai potensi untuk dikomersialkan. Antaranya ialah pembangunan mesin pemeringkatan tegasan kayu bagi balak kayu keras campuran, terhasil daripada dana Tabung Pembangunan Industri Kayu-Kayan Malaysia berjumlah RM1 juta. Turut dijalankan ialah pembangunan kaedah penilaian deria ke atas minyak pati (spesies *Aquilaria* dan *Curcuma*) untuk kawalan kualiti dalam industri herba. Satu pendedahan reka cipta yang bertajuk *Gaharu Sense: Intelligent Classification System for Agarwood* telah didaftarkan; di samping telah memenangi pelbagai anugerah di peringkat kebangsaan dan antarabangsa.

FRIM melonjakkan reputasinya pada 2010 dengan menganjurkan beberapa majlis antarabangsa di dalam negara yang dapat menyediakan peluang kepada pihak-pihak yang berkepentingan untuk pemindahan teknologi dan membina jalinan kerjasama. Sejumlah 32 acara telah dianjurkan dan telah mendapat liputan meluas pihak media. Antaranya ialah Simposium Antarabangsa Kelip-Kelip yang Kedua pada 2 Ogos, Simposium Antarabangsa Perhutanan dan Keluaran Hutan yang diadakan dua tahun sekali pada 5–7 Oktober, Persidangan *Best of Both Worlds* pada 8–13 November dan Simposium Antarabangsa Pasoh 2010, 10–14 November. Acara-acara ini berjaya merapatkan lagi jalinan hubungan antara pakar-pakar dan juga peserta tempatan dan antarabangsa.

Acara utama 2010 ialah Pengisytiharan secara rasmi FRIM sebagai Tapak Warisan Semula Jadi oleh mantan Perdana Menteri, Y A Bhg Tun Abdullah Hj Ahmad Badawi pada 19 November. Ini merupakan satu pencapaian bersejarah bagi FRIM, bukan sahaja disebabkan oleh FRIM kaya dengan sejarah serta keajaiban semula jadinya, tetapi FRIM juga merupakan satu testimoni hidup ke atas pemuliharaan dan pemuliharaan hutan menerusi sains dan penyelidikan.

Sesebuah institut penyelidikan tidak akan dapat mencapai status berkelas dunia tanpa saintisnya yang komited dan berdedikasi. Saya menyanjung tinggi Dr Lee Su See kerana menjadi wanita pertama dilantik sebagai Naib Presiden dalam sejarah 118 tahun *International Union of Forest Research Organization* (IUFRO). Beliau bukanlah asing di kalangan komuniti saintifik dan begitu disegani oleh rakan-

expertise. The findings were later published in a book entitled, *Laporan Inventori Dirian Hutan Kampus FRIM*, as well as *FRIM: Tapak Warisan Semula Jadi* which won the National Book Award for the Best Technical Book Category. The award, given in recognition of FRIM's effort in intensifying efforts to produce scientific publications intended essentially for public consumption, was presented by the Prime Minister's wife, Y A Bhg Datin Seri Rosmah Mansor, on 16 December 2010. Other notable publications included two *Flora of Peninsular Malaysia* series, focusing on ferns, lycophytes and seed plants, and the *Malaysia Plant RED List*.

A number of research results were also recognized for their commercial potential. Among these was the development of a stress grading machine for mixed hardwood timber that resulted from the RM1 million project financed by the Malaysian Timber Industries Development Fund. There was also the development of a sensory evaluation method of essential oils (*Aquilaria* and *Curcuma* species) for quality control in the herbal industry. An invention disclosure entitled, “Gaharu Sense: Intelligent Classification System for Agarwood”, has been registered on top of having received several national and international awards.

FRIM upheld its reputation in 2010 for organizing relevant international events locally, providing our local stakeholders with opportunities for technology transfer and networking. A total of 32 events were organized, a majority of which received considerable media coverage. Among these were the Second International Firefly Symposium on 2 August, the biannual International Symposium on Forestry and Forest Products (ISFFP), 5–7 October, Best of Both Worlds Conference, 8–13 November, and the International Pasoh Symposium 2010, 10–14 November. These events brought together local as well as international experts and participants.

The highlight of 2010 was the Official Declaration of FRIM as a Natural Heritage Site, by former Malaysian Prime Minister, Y A Bhg Tun Abdullah Badawi, on 19 November. It was a historic achievement for FRIM, not only because FRIM is rich in history and natural wonders, but also that it is a living testimony of how forests can be rehabilitated and conserved through science and research.

A research institute could not achieve world class status if not for its committed and dedicated scientists. I take my hat off to Dr Lee Su See for being the first lady ever in the 118 years of history of the International Union of Forest Research Organizations (IUFRO), to be elected as Vice President. She is no stranger to the scientific community and is highly regarded among her peers. On behalf of the Board, I would also like to congratulate the researchers and supporting staff in FRIM, particularly Dr Nor Azah Mohd Ali and Tnah Lee Hong, on being award recipients at the XXIII IUFRO World Congress on 23–28 August 2010 in Seoul, Korea.

Dr Nor Azah received the IUFRO Scientific Achievement Award for her excellent contribution in the field of natural products chemistry, specializing in essential oil research related to forestry, agriculture and herbal products while Tnah received the Student Award for Excellence in Forest Sciences, for her

rakan seperjuangannya. Bagi pihak Lembaga, saya juga ingin mengucapkan tahniah kepada para penyelidik serta penjawat awam sokongan di FRIM terutamanya Dr Nor Azah Mohd Ali dan Tnah Lee Hong yang dipilih sebagai penerima anugerah sempena Kongres Sedunia IUFRO XXIII pada 23–28 Ogos di Seoul, Korea.

Dr Nor Azah menerima Anugerah Pencapaian Saintifik IUFRO kerana sumbangan cemerlang beliau dalam bidang kimia produk semula jadi, pengkhususan kepada penyelidikan minyak pati yang berkaitan dengan produk perhutanan, pertanian dan herba. Manakala Tnah pula menerima Anugerah Pelajar bagi Kecemerlangan dalam Sains Hutan di atas kajiannya tentang pangkalan data DNA yang direka bentuk untuk membasmi pembalakan haram. Terdapat juga beberapa anugerah dan pencapaian penting yang lain oleh penjawat awam FRIM, dan saya ingin mengambil kesempatan ini untuk mengucapkan tahniah kepada mereka semua.

Selain pencapaian dalam penyelidikan dan pembangunan, FRIM juga menerima anugerah Penyumbang Kecemerlangan Kanak-Kanak APECP 2009/2010 bagi Destinasi Ekopendidikan Mesra Kanak-Kanak daripada *Association of Professional Early Childhood Providers Malaysia* (APECP), di atas sumbangan cemerlangnya dalam pendidikan, penjagaan dan pembangunan awal kanak-kanak di Malaysia. Untuk empat tahun berturut-turut, FRIM berjaya mengekalkan pensijilan MS ISO 9001:2008 bagi perkhidmatannya yang berkualiti. Tahniah!

### **Hala Tuju Masa Hadapan**

Pihak Lembaga, bersama-sama dengan pihak pengurusan, sentiasa berusaha untuk memastikan aktiviti R&D FRIM adalah relevan dengan isu-isu dan permintaan daripada pihak-pihak yang berkepentingan. Sebagai memenuhi peningkatan permintaan ke atas gaharu (*Aquilaria* spp.), Lembaga telah meluluskan penubuhan satu kumpulan kerja yang diketuai oleh FRIM untuk menyediakan draf pelan tindakan yang menyusun-atur strategi untuk menyokong industri gaharu.

Pada bulan April, satu Panel Penasihat Teknikal (TAP) telah dilantik untuk menilai aktiviti penyelidikan serta menyediakan syor-syor ke arah memajukan Bahagian Tumbuhan Ubatan. Laporan tersebut telah disemak dan diterima oleh Lembaga. Antara syor TAP ialah Bahagian tersebut perlu lebih memberi fokus terhadap produk ubatan tradisional berbanding aktiviti penemuan ubatan yang mengambil masa yang lama untuk menghasilkan keputusan yang sah. Di sebaliknya, produk tumbuhan tradisional hanya memerlukan kita mengguna pakai pengetahuan tradisi dan seterusnya membangunkannya menggunakan teknologi moden.

### **Penghargaan**

Saya ingin mengambil kesempatan ini untuk mengucapkan tahniah kepada ahli Lembaga, Tuan Hj Abdul Ghani Salleh, Pengarah Kemajuan Negeri Selangor di atas penganugerahan pingat Kurnia Darjah Mulia Seri Melaka (DMSM) oleh TYT Negeri Melaka, yang membawa gelaran Datuk. Tahniah juga

research on a DNA database designed to curb illegal logging. There were also other notable awards and achievements of FRIM staff, and I would like to take this opportunity to congratulate each and every one of them!

Apart from research and development achievements, FRIM also received the APECP Excellent Child Contributor Award 2009/2010 for Child-Friendly Eco-Education Destination from the Association of Professional Early Childhood Providers Malaysia (APECP), for its contribution towards providing excellent services in early childhood education, care and development in Malaysia. For the fourth consecutive year, FRIM received the MS ISO 9001:2008 certification for its quality services. Congratulations!

### **Future Direction**

The Board, together with the management, has always striven to ensure that FRIM R&D activities are relevant to emerging issues and demands from its stakeholders. Responding to the increasing demand for agarwood (*Aquilaria* spp.), the Board approved the setting up of a working group led by FRIM to draft an action plan looking into strategizing ways to support the gaharu industry.

In April, a Technical Advisory Panel (TAP) was also appointed to assess the research activities and provide suggestions on the way forward for the Medicinal Plants Division. The report of the TAP was reviewed and accepted by the Board. Among its recommendations was for the division to place more focus on traditional medicinal products rather than drug discovery activities which will take a longer time to produce affirmative results. Traditional medicinal products, on the other hand, would require tapping into existing traditional knowledge and building upon it using modern technology.

### **Acknowledgement**

I would like to take this opportunity to congratulate our Board member, Tn Hj Abdul Ghani Salleh, the Director of Selangor State Development, on his conferment of Kurnia Darjah Mulia Seri Melaka (DMSM) by the Tuan Yang Terutama Yang di-Pertua Negeri Melaka, which carries the title Datuk. Also congratulations to former Board member, YB Dato' Dr James Dawos Mamit, who was appointed the Deputy Minister of Tourism.

To all the Board members, thank you for the warm welcome I have received since chairing the first meeting in August, and I look forward to a memorable and successful term with all of you.

Lastly, on behalf of the Board, I would like to express my heartiest congratulations to the management and staff of FRIM for a wonderful and successful year of achievements – thank you for your continuous commitment and efforts in placing FRIM on the global map. It is my hope that FRIM will continue to contribute significantly towards the achievement of the National Key Economic Areas (NKEA) under the 10th Malaysian Plan and play a major role in steering the nation

diucapkan kepada Ahli Lembaga, YB Dato' Dr James Dawos Mamit yang dilantik sebagai Timbalan Menteri Pelancongan.

towards continued economic growth through green and cutting-edge technology.

Kepada semua ahli Lembaga, saya ingin mengucapkan terima kasih kerana telah memberikan kerjasama sejak saya mempengerusikan mesyuarat pertama pada bulan Ogos, dan saya harap dapat bekerjasama lagi dengan semua ahli Lembaga.

Akhir sekali, bagi pihak Lembaga, saya juga ingin mengucapkan tahniah kepada pengurusan dan penjawat awam FRIM di atas pencapaian yang memberangsangkan pada tahun ini—terima kasih di atas komitmen dan usaha secara berterusan dalam menempatkan FRIM di peta dunia. Harapan saya, FRIM akan terus memberi sumbangan yang signifikan ke arah pencapaian dalam Bidang-Bidang Keutamaan Ekonomi Negara (NKEA) di bawah Rancangan Malaysia ke-10 serta memainkan peranan utama dalam memacu negara ke arah pertumbuhan ekonomi secara berterusan menerusi teknologi hijau dan teknologi baharu.



**YB PN/MDM HAJAH NANCY HJ SHUKRI**  
**KMN, AMN**  
**PENGERUSI/CHAIRPERSON**  
**MFRDB**

## AHLI LEMBAGA BOARD MEMBERS

### Pengerusi Chairpersons

DATUK SUBOH MOHD YASSIN (Sehingga/Until 31 Mei/May)  
PJM, DPSJ, KMN

YB PN/MDM HAJAH NANCY HJ SHUKRI  
(Dari/From 15 Julai/July)  
KMN, AMN

### Ahli dan Ahli Silih Ganti Members and Alternate Members

#### Kementerian Sumber Asli dan Alam Sekitar Malaysia Ministry of Natural Resources and Environment Malaysia (NRE)

DATUK AZIYAH MOHAMED  
PMW, DNS, ANS, DBNS

PN/MDM ZURINAH PAWANTEH  
(Ahli silih ganti/Alternate member)

#### Penasihat Alam Sekitar Negeri Sarawak Sarawak State Environmental Advisor

YB DATO' DR JAMES DAWOS MAMIT  
PSBS  
(Sehingga/Until 31 Januari/January)

#### Kementerian Kewangan Ministry of Finance (MOF)

EN/MR ZURAIIDI HUSAIN  
PN/MDM ADENA AHMAD  
(Sehingga/Until 30 September)

EN/MR WAN FARISAN WAN SULAIMAN  
(Dari/From 1 Oktober/October)  
(Ahli silih ganti/Alternate member)

#### Jabatan Perhutanan Semenanjung Malaysia (JPSM) Forestry Department of Peninsular Malaysia

DATO' RAZANI UJANG  
DIMP, SSA

DATO' ABDUL RAHMAN HJ ABDUL RAHIM  
DIMP, ANS  
(Ahli silih ganti/Alternate member)

#### Lembaga Perindustrian Kayu Malaysia Malaysian Timber Industry Board (MTIB)

PROF MADYA/ASSOC PROF DR JALALUDDIN HARUN

TN HJ OSMAN HJ KASIM  
(Ahli silih ganti/Alternate member)

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

DATO' SHEIKH OTHMAN SHEIKH ABDUL RAHMAN  
DIMP, JP

EN/MR CHOONG KIAN KEE  
(Ahli silih ganti/Alternate member)

#### Persatuan Industri Kayu-Kayan Malaysia Malaysian Wood Industries Association (MWIA)

EN/MR NG KAY YIP

EN/MR PON CHIA HWEE  
(Ahli silih ganti/Alternate member)

#### Persatuan Pengusaha Kayu-Kayan dan Perabot Bumiputera Malaysia (PEKA) Association of Malaysian Bumiputera Timber and Furniture Entrepreneurs

TN HJ IR WAHID JAAFAR

TN HJ HANAFEE YUSOFF  
SMK  
(Ahli silih ganti/Alternate member)

#### Lembaga Getah Malaysia (LGM) Malaysian Rubber Board

DR CHAN HEUN YIN  
JSM

#### Kementerian Sains, Teknologi dan Inovasi Ministry of Science, Technology and Innovation (MOSTI)

PROF DATO' DR MOHAMED ISA ABD MAJID  
DSPN

#### Pejabat Pembangunan Negeri Selangor Selangor State Development Office

DATUK HJ ABDUL GHANI SALLEH  
DMSM, KMN, SMS, AMS, PPT

**Yayasan Sabah**  
**Sabah Foundation**

TN HJ MOHD DAUD TAMPOKONG

**Jabatan Perhutanan Sarawak**  
**Sarawak Forestry Department**

DATU HJ LEN TALIF SALLEH  
DJBS, PPB, PBK

EN/MR ABANG MOHD MOHTAR ABANG PAWOZAN  
(Ahli silih ganti/*Alternate member*)

**Pejabat Setiausaha Kerajaan Negeri Selangor**  
**Selangor State Secretary Office**

DATO' NOORDIN SULAIMAN  
DPMS, SIS

**Pusat Kepelbagaian Biologi Sarawak**  
**Sarawak Biodiversity Centre (SBC)**

DR RITA MANURUNG (Dari/*From* 1 Jun/*June*)  
PPB, PBK

**Institut Penyelidikan Perhutanan Malaysia**  
**Forest Research Institute Malaysia (FRIM)**

DATO' DR ABD LATIF MOHMOD  
DIMP, JSM, KMN, AMN

## AHLI LEMBAGA BOARD MEMBERS



**Pengerusi/Chairperson**  
YB PN/MDM HAJAH NANCY HJ SHUKRI  
KMN, AMN



DATUK AZIYAH MOHAMED  
PMW, DNS, ANS, DBNS



EN/MR ZURAIIDI  
HUSAIN



DATO' RAZANI UJANG  
DIMP, SSA



PROF MADYA/  
ASSOC PROF DR  
JALALUDDIN HARUN



DATO' SHEIKH  
OTHMAN SHEIKH  
ABDUL RAHMAN  
DIMP, JP



EN/MR NG KAY YIP



TN HJ IR WAHID JAAFAR

DR CHAN HEUN YIN  
JSM

PROF DATO' DR  
MOHAMED ISA ABD  
MAJID, DSPN

DATUK HJ ABDUL  
GHANI SALLEH  
DMSM, KMN, SMS,  
AMS, PPT

DATU HJ LEN TALIF  
SALLEH  
DJBS, PPB, PBK

DATO' NOORDIN  
SULAIMAN  
DPMS, SIS

DR RITA MANURUNG  
PPB, PBK

DATO' DR ABD LATIF  
MOHMOD  
DIMP, JSM, KMN, AMN

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TN HJ MOHD DAUD TAMPOKONG

## JAWATANKUASA KEWANGAN DAN PERJAWATAN (JKKP) FINANCE AND ESTABLISHMENT COMMITTEE

### Pengerusi Chairman

DATUK SUBOH MOHD YASSIN (Sehingga/Until 31 Mei/May)  
PJN, DPSJ, KMN  
YB PN/MDM HAJAH NANCY HJ SHUKRI  
(Dari/From 15 Julai/July)  
KMN, AMN

### Ahli dan Ahli Silih Ganti Members and Alternate Members

#### Kementerian Sumber Asli dan Alam Sekitar Ministry of Natural Resources and Environment Malaysia (NRE)

DATUK AZIYAH MOHAMED  
PMW, DNS, ANS, DBNS  
PN/MDM ZURINAH PAWANTEH  
(Ahli silih ganti/Alternate member)

#### Kementerian Kewangan Ministry of Finance (MOF)

EN/MR ZURAIID HUSAIN  
PN/MDM ADENA AHMAD (Sehingga/Until 30 September)  
EN/MR WAN FARISAN WAN SULAIMAN (Dari/From 1  
Oktober /October)  
(Ahli silih ganti/Alternate member)

#### Jabatan Perhutanan Semenanjung Malaysia (JPSM) Forestry Department of Peninsular Malaysia

DATO' RAZANI UJANG  
DIMP, SSA  
DATO' ABDUL RAHMAN HJ ABDUL RAHIM  
DIMP, ANS  
(Ahli silih ganti/Alternate member)

#### Persatuan Industri Kayu-Kayan Malaysia Malaysian Wood Industries Association (MWIA)

EN/MR NG KAY YIP  
EN/MR PON CHIA HWEE  
(Ahli silih ganti/Alternate member)

#### Lembaga Getah Malaysia (LGM) Malaysian Rubber Board

DR CHAN HEUN YIN  
JSM

#### Institut Penyelidikan Perhutanan Malaysia Forest Research Institute Malaysia (FRIM)

DATO' DR ABD LATIF MOHMOD  
DIMP, JSM, KMN, AMN

## JAWATANKUASA AUDIT/AUDIT COMMITTEE

### Pengerusi/Chairman

#### Kementerian Sumber Asli dan Alam Sekitar Malaysia Ministry of Natural Resources and Environment Malaysia (NRE)

DATUK AZIYAH MOHAMED  
PMW, DNS, ANS, DBNS  
PN/MDM ZURINAH PAWANTEH  
(Ahli silih ganti/Alternate member)

### Ahli dan Ahli Silih Ganti Members and Alternate Members

#### Kementerian Kewangan/Ministry of Finance (MOF)

EN/MR ZURAIID HUSAIN  
PN/MDM ADENA AHMAD (Sehingga/Until 30 September)  
EN/MR WAN FARISAN WAN SULAIMAN (Dari/From 1  
Oktober)  
(Ahli silih ganti/Alternate member)

#### Lembaga Perindustrian Kayu Malaysia Malaysian Timber Industry Board (MTIB)

PROF MADYA/ASSOC PROF DR JALALUDDIN HARUN  
TN HJ OSMAN HJ KASIM  
(Ahli silih ganti/Alternate member)

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

DATO' SHEIKH OTHMAN SHEIKH ABDUL RAHMAN  
DIMP, JP  
EN/MR CHOONG KIAN KEE  
(Ahli silih ganti/Alternate member)

#### Pejabat Pembangunan Negeri Selangor Selangor State Development Office

DATUK HJ ABDUL GHANI SALLEH  
DMSM, KMN, SMS, AMS, PPT

#### Pejabat Setiausaha Kerajaan Negeri Selangor Selangor State Secretary Office

DATO' NOORDIN SULAIMAN  
DPMS, SIS





**Institut Penyelidikan Perhutanan Malaysia**  
**Forest Research Institute Malaysia (FRIM)**

**LAPORAN KETUA PENGARAH  
DIRECTOR GENERAL'S REPORT**



**DATU' DR ABD LATIF MOHMOD**  
**DIMP, JSM, KMN, AMN**  
Ketua Pengarah/Director General FRIM

Tahun 2010 bersamaan dengan sambutan ulang tahun FRIM ke-25. Satu aktiviti FRIM yang signifikan bersempena dengan sambutan jubli peraknya pada tahun ini ialah pengisytiharan secara rasmi kampus induknya di Kepong sebagai salah sebuah tapak warisan semula jadi negara, dan pada masa yang sama berusaha untuk mendapatkan pengiktirafan sebagai tapak warisan semula jadi dunia pada masa hadapan. FRIM berbangga di atas kejayaannya dinobatkan sebagai tapak warisan semula jadi negara bukan hanya kerana pengiktirafannya sebagai suatu lokasi penting di negara ini tetapi juga ke arah perlindungan hutannya untuk tujuan penyelidikan serta untuk dinikmati oleh generasi akan datang. FRIM adalah unik memandangkan hutannya merupakan hutan tropika buatan manusia yang terbesar di dunia dan boleh menjadi model dunia dalam penghutanan semula, pengurusan dan perlindungan hutan. Majlis perasmian disempurnakan oleh mantan Perdana Menteri, Tun Abdullah Haji Ahmad Badawi, yang turut memperkenalkan plak Warisan yang terletak di pintu masuk ke Muzium dan Galeri Penyelidikan FRIM.

Penerbitan FRIM yang bertajuk “FRIM Tapak Warisan Semula Jadi Negara” telah memenangi Anugerah Buku Negara 2010 dalam kategori Buku Teknikal Terbaik. Buku tersebut mengandungi 194 muka surat dan sembilan bab, antara lain menyediakan pemahaman tentang sejarah FRIM, perjuangannya dalam memelihara hutannya daripada dicerobohi untuk tujuan pembangunan, keunikan semula jadinya serta kekayaan biodiversitinya. Buku ini telah dilancarkan oleh Tun Abdullah Haji Ahmad Badawi semasa Majlis Pengisytiharan FRIM Sebagai Tapak Warisan Semula Jadi pada 18 November. Selain itu, buku bertajuk “100 years of Tropical Forest Research” telah diterbitkan sempena sambutan jubli perak ini. Antara pencapaian utama yang ditonjolkan ialah sumbangan penting FRIM dalam membangunkan sistem pengurusan hutan bakau, peningkatan dalam industri perabot daripada kayu getah serta lengkapnya pendokumentasian sebanyak 2830 spesies pokok di Semenanjung Malaysia.

FRIM turut menerima Anugerah *Association of Professional Early Childhood Providers Malaysia (APECP) Excellent Child Contributor Award 2009/2010 for Child-Friendly Eco-Education Destination* pada 31 Mac. Turut memeriahkan majlis ialah DYT M Tuanku Syed Faizuddin Putra ibni Tuanku Syed Sirajuddin Jamalullail, Raja Muda Perlis dan DYT M Tuanku Hajjah Lailatul Shahreen Akashah Khalil, Raja Puan Muda Perlis, yang juga merupakan penaung APECP. Anugerah ini mengiktiraf FRIM selaku institusi terbaik yang menyediakan pendidikan cemerlang dalam kesedaran alam sekitar kepada kanak-kanak generasi akan datang.

Pada 2010, penyelidik FRIM, Puan Nor Datiakma Mat Amin memenangi Pingat Emas dan piala Anugerah Keseluruhan Terbaik di bawah kategori Sains, Kejuruteraan dan Teknologi bagi penyelidikannya tentang “Anti-Multidrug Resistant *Staphylococcus aureus* (MRSA) Activity of Euphorbiaceae Leaves Extract” sempena *IUM Research, Invention and Innovation Exhibition (IRIIE 2010)* yang diadakan pada 26 hingga 27 Januari. Kajian beliau menyingkap potensi agen

The year 2010 coincided with FRIM's 25th anniversary. A significant activity of FRIM in conjunction with its silver jubilee celebration this year was the official declaration of its main campus in Kepong as one of the country's natural heritage sites, whilst setting its sight on attaining world heritage recognition in the future. FRIM is proud of achieving the natural heritage status not just because of the recognition as a place of importance in the country but mainly for the protection of its forests for continued research activities as well as for the enjoyment of future generations. FRIM is unique as it is the largest man-made tropical forest in the world, and it can serve as a model of reforestation, forest management and forest protection for the world. The ceremony was officiated by former Prime Minister Tun Abdullah Haji Ahmad Badawi, who also unveiled the Warisan plaque installed at the entrance of the FRIM Museum and Research Gallery.

The FRIM publication entitled *FRIM Tapak Warisan Semula Jadi Negara* won the National Book Award 2010 in the Best Technical Book category. The book, containing 194 pages and nine chapters, provides an insight into the history of FRIM, its struggle to protect its forest against encroachment by development, its natural uniqueness as well as its biodiversity richness, among others. The warisan book was launched by Tun Abdullah Haji Ahmad Badawi at the Institute's Heritage Site Declaration Ceremony on 18 November. In addition, the book *100 years of Tropical Forest Research* was published to commemorate the silver jubilee celebration. Among the notable successes highlighted are the substantial contribution of developing management system for mangrove forests, the rise of the furniture industry based on rubberwood, and the complete documentation of the 2,830 species of trees of Peninsular Malaysia.

FRIM received the Association of Professional Early Childhood Providers Malaysia (APECP) Excellent Child Contributor Award 2009/2010 for Child-Friendly Eco-Education Destination on 31 March. Gracing the event were DYT M Tuanku Syed Faizuddin Putra ibni Tuanku Syed Sirajuddin Jamalullail, Raja Muda Perlis, and DYT M Tuanku Hajjah Lailatul Shahreen Akashah Khalil, Raja Puan Muda Perlis, also Patron of APECP. FRIM was recognized as the best institute for providing excellent environmental awareness education for children of the upcoming generation.

For the year 2010, FRIM researcher Nor Datiakma Mat Amin won a Gold Medal and the Best Overall Award trophy under the category of Science, Engineering and Technology for her research on “Anti-Multidrug Resistant *Staphylococcus aureus* (MRSA) Activity of Euphorbiaceae Leaf Extract” at the recent *IUM Research, Invention and Innovation Exhibition (IRIIE 2010)* held from 26 to 27 January. Her research unveiled the potential of anti-MRSA agents derived from crude extract of Euphorbiaceae leaf, where the anti-MRSA activity is found to be comparable with that of oxacillin antibiotics used clinically for treatment of MRSA infection. The extract also demonstrates very low toxicity effect on mice.

anti-MRSA yang diperoleh daripada ekstrak mentah daun Euphorbiaceae yang mendapati aktiviti anti-MRSA adalah setanding dengan antibiotik oksasilin yang digunakan untuk merawat jangkitan MRSA. Ekstrak ini juga menunjukkan kesan ketoksikan yang rendah ke atas mencit.

Tiga makmal FRIM menerima Anugerah Kecemerlangan Makmal dari Institut Kimia Malaysia di majlis makan malam dan penyampaian anugerah tahunan IKM. Ketiga-tiga makmal tersebut ialah Makmal Kimia Tanah, Makmal Komposit Kayu dan Makmal Analisis Awetan Kayu. Makmal Analisis Awetan Kayu turut menerima Anugerah Plak Emas kerana berjaya mengekalkan Anugerah Makmal Cemerlang selama 15 tahun berturut-turut. Majlis yang berlangsung di Pusat Konvensyen Sime Darby di Kuala Lumpur pada 10 Disember dirasmikan oleh Menteri Sains, Teknologi dan Inovasi, YB Datuk Seri Dr Maximus Johnity Ongkili.

Para penyelidik FRIM merangkul tiga pingat perak dan tiga pingat gangsa pada Ekspo Teknologi Malaysia (MTE 2010) di Pusat Dagangan Dunia Putra, Kuala Lumpur dari 4 hingga 6 Februari. Penyelidikan yang bertajuk *The Resin Impregnated Oil Palm Flooring, Engineered Flooring from Oil Palm Trunk*, dan *Super Palmply* merangkul pingat perak, manakala *Environmentally Friendly Carbonization Using the Drum Method, Synthetic Seeds of Timber Species: An Alternative for Sustainable Planting Material for Commercial Plantations*, dan *Fabrication of a Recognition Process for Agarwood Classification Using Modified E-nose* menerima pingat gangsa.

Pasukan FRIM turut memenangi tempat pertama Festival Sains, Teknologi dan Inovasi Selangor (FesSTIS) bagi Anugerah Inovasi Cemerlang Selangor 2010 bagi kategori Inovasi untuk Kegunaan Industri. Pasukan penyelidik FRIM yang diketuai oleh Encik Hashim W. Samsi yang membangunkan *Engineered Flooring from Oil Palm Trunk* menerima piala, wang tunai berjumlah RM8000 dan sijil daripada Menteri Besar Selangor, Tan Sri Abdul Khalid Ibrahim, pada 12 Jun. Sempena Innova 2010 yang diadakan di Brussels dari 18 hingga 20 November, pasukan FRIM memenangi pingat emas bagi projek yang bertajuk *Gaharu Sense: Intelligent Classification System for Agarwood using k-NN Technique*.

Selain berjaya mengekalkan akreditasi ISO 9001: 2008, FRIM turut berjaya mendapat Pensijilan QE/ 5S daripada Perbadanan Produktiviti Malaysia (MPC). Dalam pertandingan sempena Hari Inovasi NRE, FRIM berjaya menjadi johan bagi tiga kategori (Anugerah Peneraju Kualiti Peringkat Jabatan/Agensi; Anugerah 5S Peringkat Jabatan/Agensi; Anugerah Pameran Terbaik) dan menduduki tempat kedua bagi dua pertandingan yang lain (Pertandingan Penjimatan Tenaga dan Himpunan Lagu-Lagu Dakwah).

Lima kumpulan berjaya memenangi Emas bagi inovasi sempena Hari Inovasi FRIM. Acara tahunan ini diadakan bagi menggalakkan budaya inovasi di kalangan penjawat awam dan penyelidik FRIM. Bagi pertandingan Kumpulan Inovatif dan Kreatif (KIK), kumpulan Inventori Hutan Asli muncul sebagai juara bagi kategori teknikal manakala kumpulan J'MAT memenangi tempat pertama bagi kategori pengurusan.

Three laboratories of FRIM received the Malaysian Institute of Chemistry's the Excellent Laboratory Award at the IKM annual dinner and award presentation ceremony this year. The three laboratories were the Soil Chemistry Laboratory, the Wood Composite Testing Laboratory, and the Wood Preservative Analytical Laboratory. The Wood Preservative Analytical Laboratory was also given the Gold Plaque Award for receiving the Excellent Laboratory Award for the 15th consecutive year. The event, held at the Sime Darby Convention Centre in Kuala Lumpur on 10 December, was officiated by Science, Technology and Innovation Minister Datuk Seri Dr Maximus Johnity Ongkili.

FRIM researchers clinched three silver and three bronze medals at the Malaysia Technology Expo (MTE 2010) held at the Putra World Trade Centre, Kuala Lumpur, from 4 to 6 February. The research works "Resin Impregnated Oil Palm Flooring", "Engineered Flooring from Oil Palm Trunk" and "Super Palmply" garnered silver medals, while "Environmentally Friendly Carbonization Using the Drum Method", "Synthetic Seeds of Timber Species: An Alternative for Sustainable Planting Material for Commercial Plantations" and "Fabrication of a Recognition Process for Agarwood Classification using Modified E-nose" received bronze medals.

FRIM team has also won the first place at the Selangor Science Technology and Innovation Festival (FesSTIS) for the Selangor Excellent Innovation Award 2010 under the category of innovation for industrial use. The research team led by Encik Hashim Wan Samsi that developed the "Engineered Flooring from Oil Palm Trunk" received the trophy, cash prize of RM8 000 and certificates from the Selangor Menteri Besar Tan Sri Abdul Khalid Ibrahim, on 12 June. At Innova 2010 held in Brussels from 18 to 20 November, the FRIM team won a gold medal for the project entitled "Gaharu Sense: Intelligent Classification System for Agarwood using k-NN Technique".

Apart from maintaining its ISO 9001: 2008 accreditation, FRIM also managed to be accredited with the QE/5S certification from the Malaysian Productivity Corporation (MPC). In the NRE Innovation Day competition, FRIM clinched championship for three competitions (Anugerah Peneraju Kualiti Peringkat Jabatan/Agensi; Anugerah 5S Peringkat Jabatan/Agensi; Best Exhibition Award) and was first runner-up for another two competitions (Save Energy Competition; Himpunan Lagu-Lagu Dakwah).

Five groups garnered Gold for their innovations at FRIM Innovation Day competition. It is an event held annually to encourage a culture of innovation amongst the institute's staff and researchers. For the Innovative and Creative Circle (KIK) Competition, the Natural Forest Inventory group emerged as the winner for the technical category while J'MAT team won first place for the management category. In conjunction with this, three special awards were given to selected "tokoh" (leaders) for their significant contributions to the institute: Dr Mohamad Omar Mohamad Khaidzir for reviving the use

Di samping itu, tiga anugerah khas telah diberikan kepada tokoh-tokoh terpilih di atas sumbangan penting mereka kepada institut iaitu Dr Mohamad Omar Mohamad Khaidzir di atas kejayaannya memulihkan semula penggunaan peralatan pemrosesan kayu; Encik Puad Elham yang memainkan peranan penting dalam mencipta budaya berinovasi di kalangan penjawat awam FRIM, dan Puan Salamah Selamat di atas sumbangan beliau terhadap penubuhan sistem audit kualiti FRIM.

Beberapa orang pegawai FRIM telah dianugerahi darjah dan pingat kebesaran negeri dan negara. Dr Aminah Hamzah menerima (Kesatria Mangku Negara, KMN), Dr Mohd Noor Mahat (Ahli Mangku Negara, AMN), Puan Norziah Salleh, Puan Zarah Bachik and Encik Mohd Mohd Sahat (Pingat Pangkuan Negara, PPN), Dr Raja Barizan Raja Sulaiman (Pingat Seri Mahkota Pahang, SMP), Encik Abdul Rahim Ahmad, Encik Salen Ismail and Encik Abdul Molok Abdul Ghani (Pingat Jaksa Kebaktian, PJK), Encik Othman Hasin (Pingat Perkhidmatan Lama, PPL), dan Encik Muhammad Deraman (Pingat Pekerti Terpilih, PPT).

FRIM telah memberikan pelbagai anugerah kepada penjawat awamnya sebagai pengiktirafan kepada prestasi cemerlang, sumbangan serta kejayaan di sepanjang tahun sempena Majlis Penyampaian Anugerah tahunan pada 18 Jun. Institut turut menganugerahi Anugerah Lembaga Penyelidikan dan Pembangunan Perhutanan Malaysia (MFRDB) kepada dua orang mantan Timbalan Ketua Pengarahnya, Prof Dato' Dr Wan Razali Wan Mohd dan Dr Francis SP Ng. Sempena Sambutan Ulang Tahun ke-25, FRIM telah menjemput para pesara FRIM termasuk Ketua Pengarah yang pertama, Tan Sri Dr Salleh Mohd Nor yang menerima Anugerah MFRDB pada tahun sebelumnya, untuk menghadiri majlis pada tahun ini sebagai tanda penghormatan dan terima kasih di atas sumbangan mereka kepada institut. Majlis tersebut juga menyaksikan penyampaian anugerah Ketua Pengarah, saintis terbaik, penyelidikan terbaik, anugerah khidmat setia, khidmat cemerlang individu dan kumpulan, khidmat masyarakat, tesis terbaik, penerbitan terbaik, penerbitan kertas penyelidikan di dalam jurnal terkemuka atau jurnal berfaktor impak tinggi serta kecemerlangan dalam bidang sukan.

Prestasi FRIM dalam pembangunan modal insan cukup memberangsangkan dengan enam orang pegawai berjaya menamatkan pengajian lepasan ijazah masing-masing. Tahniah kepada Khairul Awang (Universiti Sains Malaysia), Nur Hanan Murni Yunos (University of Sydney), Mohd Farid Ahmad (Universiti Sains Malaysia), Mohd Zaki Abdullah (Universiti Putra Malaysia), dan Tnah Lee Hong (Universiti Malaya) yang berjaya memperoleh Ph.D. serta Liza Ismail (Universiti Putra Malaysia), Shereen Haron (Universiti Kebangsaan Malaysia), Norain Mohd Arif (Universiti Teknologi MARA), dan Nor Datiakma Mat Amin (Universiti Islam Antarabangsa) yang berjaya memperoleh MSc.

Lima Memorandum Persefahaman (MoU) dan 16 Perjanjian (termasuk lima untuk Perjanjian perlesenan) telah ditandatangani dengan pelbagai institusi penyelidikan, agensi kerajaan dan syarikat dari dalam dan luar negara.

of old wood processing equipment; Encik Puad Elham for his role in creating a culture of innovation amongst FRIM staff; and Puan Salamah Selamat for the establishment of FRIM's quality audit system.

Several FRIM officers were conferred honorary national and state awards: Dr Aminah Hamzah (Kesatria Mangku Negara, KMN), Dr Mohd Noor Mahat (Ahli Mangku Negara, AMN), Mdm Norziah Salleh, Mdm Zarah Bachik and Mr Mohd Mohd Sahat (Pingat Pangkuan Negara, PPN), Dr Raja Barizan Raja Sulaiman (Pingat Seri Mahkota Pahang, SMP), Mr Abdul Rahim Ahmad, Mr Salen Ismail and Mr Abdul Molok Abdul Ghani (Pingat Jaksa Kebaktian, PJK), Mr Othman Hasin (Pingat Perkhidmatan Lama, PPL), and Mr Muhammad Deraman (Pingat Pekerti Terpilih, PPT).

FRIM presented various awards to its staff in recognition of their outstanding performances, contributions and achievements over the past one year at its Annual Awards Ceremony on 18 June. The Institute also presented the Malaysian Forestry Research and Development Board (MFRDB) Award to two former Deputy Director Generals, Prof Dato' Dr Wan Razali Wan Mohd and Dr Francis S.P. Ng. In conjunction with its 25th Anniversary Celebration, FRIM invited all retirees including the first DG, Tan Sri Dr Salleh Mohd Nor, who received the MFRDB Award last year, to attend this year's event as a gesture of respect and gratitude for their contributions to the institute. The ceremony also included the presentation of the Director General's award, best scientist and research awards, as well as other awards for the best employee, long service, excellent service (individual and group), community service, best thesis and publication, publication of research papers in renowned or high impact journals, and for excellence in sports.

FRIM's performance in human resource development was outstanding in that nine officers completed their postgraduate training. Congratulations go to Khairul Awang (Universiti Sains Malaysia), Nur Hanan Murni Yunos (University of Sydney), Mohd Farid Ahmad (Universiti Sains Malaysia), Mohd Zaki Abdullah (Universiti Putra Malaysia) and Tnah Lee Hong (Universiti Malaya) for obtaining their doctorates, and Liza Ismail (Universiti Putra Malaysia), Shereen Haron (Universiti Kebangsaan Malaysia), Norain Mohd. Arif (Universiti Teknologi MARA), and Nor Datiakma Mat Amin (Universiti Islam Antarabangsa) for completing their Master's degrees.

Five MoUs and 16 Agreements (including five Licensing Agreements) were signed with various national and international research institutes, government agencies and companies. Some examples of MoUs include those with the University Kuala Lumpur Malaysian Institute of Aviation Technology (UniKL MIAT) to initiate R&D of bamboo composite products for the aviation industry; and the Garisan Etika (M) Sdn Bhd to develop technology for pretreatment of oil palm empty fruit bunch to ensure the most efficient and reliable combustion in the biomass power plant. FRIM conducted 39 consultancies worth RM894 186, with the private sector being the major

Antaranya termasuklah MoU dengan *University Kuala Lumpur Malaysian Institute of Aviation Technology* (UniKL MIAT) bagi menjalankan R&D ke atas produk komposit buluh untuk industri penerbangan; dan Garisan Etika (M) Sdn Bhd untuk membangunkan teknologi prarawatan tandan kosong kelapa sawit untuk memastikan pembakaran yang cekap dan boleh dipercayai dalam loji kuasa biojisim. FRIM menjalankan 39 khidmat perundingan bernilai RM894 186 dengan sektor swasta menjadi pelanggan utama. Penemuan penyelidikan FRIM menghasilkan 15 pendedahan reka cipta, dua pemfailan paten dan satu paten.

FRIM menghasilkan sejumlah 151 penerbitan dengan 30 judul diterbitkan oleh FRIM. Antara judul penerbitan ialah jilid pertama bagi kedua-dua *Flora of Peninsular Malaysia Series I Ferns and Lycophytes*, dan *Series II Seed Plants*; empat buku mewah—*100 Years of Tropical Forest Research*, *Timber Features at FRIM*, *Unsung Heroes of the Mudflat*, dan *FRIM Tapak Warisan Semula Jadi Negara*.

FRIM berjaya memperoleh pembiayaan berjumlah RM5.57 juta bagi 21 projek dari Kementerian Sains, Teknologi dan Inovasi (MOSTI), Kementerian Pertanian dan Industri Asas Tani (MOA) dan Tabung Pembangunan Industri Kayu-Kayan Malaysia (TPIKM).

Sebanyak 23 aktiviti utama program tanggungjawab sosial korporat telah dianjurkan oleh FRIM. Antaranya ialah program gotong-royong membersihkan pantai Tanjung Lipat di Likas, Sabah pada 24 Januari; lawatan ke rumah orang-orang tua di Kompleks Penyayang BAKTI Sungai Buloh di Bandar Sri Damansara pada 24 Februari untuk membawa keceriaan kepada para penghuninya; acara *Green Cycle II*, yang diadakan sempena sambutan Hari Ulang Tahun FRIM ke-25 dan Hari Alam Sekitar Sedunia pada 6 Jun; tiga program kesihatan sempena Bulan Kesihatan pada bulan April; dan FRIM dengan kerjasama penuntut-penuntut Universiti Teknologi Mara (UiTM) dan Universiti Tunku Abdul Rahman (UTAR) menganjurkan sambutan Hari Hutan Sedunia yang bertemakan “1Nature, 1Voice, 1Malaysia” pada 21 Mac.

FRIM sangat terhutang budi dengan Y Bhg Datuk Suboh Mohd Yassin yang telah berkhidmat sebagai Pengerusi Lembaga sejak 1 Jun 2006. Kami mengambil kesempatan ini untuk menyampaikan ucapan penghargaan di atas kebijaksanaan dan bimbingan beliau di sepanjang tempoh perkhidmatan beliau. Kami mengalu-alukan pelantikan YB Hajah Nancy Shukri sebagai Pengerusi Lembaga Penyelidikan dan Pembangunan Perhutanan Malaysia (MFRDB) mulai 15 Julai.

Dalam usaha untuk meraih pengiktirafan warisan dunia pada masa akan datang, saya ingin menekankan bahawa kita perlu menggalak, mendorong dan yang paling penting, menonjolkan mentaliti bertaraf dunia dan sikap bertanggungjawab terhadap alam sekitar. Matlamat FRIM adalah untuk menjadi institut mesra alam sepenuhnya pada 2011. Kami akan menyekat penggunaan polisterina dan beg plastik khususnya untuk pembungkusan makanan di dalam kampus. FRIM telah membangunkan pelbagai produk pembungkusan makanan mesra alam menggunakan bahan buangan pertanian seperti

client. FRIM's new research findings have led to 15 invention disclosures, two patent pending and one patent granted.

FRIM produced a total 151 publications of which 30 were published titles. Among publication titles are first volumes of both the *Flora of Peninsular Malaysia Series I Ferns and Lycophytes*, and *Flora of Peninsular Malaysia Series II Seed Plants*; four coffee-table books—*100 years of Tropical Forest Research*, *Timber Features at FRIM*, *Unsung Heroes of the Mud-flats*, and *FRIM Tapak Warisan Semula Jadi Negara*.

FRIM secured a total funding of RM5.57 million for 21 projects from the Ministry of Science, Technology and Innovation (MOSTI), Ministry of Agriculture and Agro-Based Industry (MOA) and Malaysian Timber Industry Development Fund (TPIKM).

Twenty-three FRIM corporate social initiative activities were organized. Among the highlights were: the gotong-royong programme to clean up the Tanjung Lipat beach in Likas, Sabah, on 24 January; visit to the senior citizens' centre at Kompleks Penyayang BAKTI Sungai Buloh in Bandar Sri Damansara on 24 February to bring cheer to the residents; the Green Cycle II event, held in conjunction with the celebration of FRIM's 25th Anniversary and World Environment Day on 6 June; and three health programmes in conjunction with its yearly Health Month in April. FRIM teamed up with Universiti Teknologi Mara (UiTM) and Universiti Tunku Abdul Rahman (UTAR) students to organize the World Forest Day celebration with the theme “1Nature, 1Voice, 1Malaysia” on 21 March.

FRIM is grateful to Y Bhg Datuk Suboh Mohd Yassin who had served as Board Chairman since 1 June 2006. We would like to take this opportunity to extend our most sincere gratitude to him for his wisdom and guidance throughout his tenure. We look forward to working with YB Hajah Nancy Shukri as the new Chairperson of the Malaysian Forestry Research and Development Board (MFRDB) from 15 July.

In aiming for world heritage recognition in the future, I would like to stress that there is a need to promote, encourage and, more importantly, demonstrate world-class mentality and environmentally responsible behaviour. FRIM aims to be a fully environmentally friendly institute in 2011. We shall ban the use of disposable polystyrene and plastic bags particularly for food packing in the campus. FRIM has developed various environmentally friendly food packages using agriculture wastes such as oil palm empty fruit bunch, which will be used in the institute.

In order for FRIM to leave an impact, we need to change our mode of thinking drastically towards creating outputs and outcomes that are more significant for the country. We need to think outside the box; work towards obtaining international funding; move towards commercialization systems that are more dynamic; be more innovative and continue to ensure that our research is world class, valued, and will make us all

tandan kosong kelapa sawit untuk diguna pakai di institut ini. Ke arah menghasilkan impak, kita perlu mengubah cara pemikiran secara drastik ke arah menghasilkan output dan hasil yang lebih signifikan kepada negara. Kita perlu berfikiran luas; berusaha untuk mendapatkan pembiayaan dana antarabangsa; beralih kepada sistem komersialisasi yang lebih dinamik; menjadi lebih inovatif dan terus memastikan penyelidikan bertaraf dunia, bernilai, dan akan membanggakan kita semua. Kita juga perlu memiliki kemahiran untuk menjadi lebih agresif dengan bekerja secara pantas dan di luar kebiasaan bagi menjadikan FRIM relevan dan cekap dari segi misi dan aspirasi Kementerian dan selaras dengan Program Transformasi Ekonomi dan Model Ekonomi Baru kerajaan. Sebagai rumusan, marilah kita teruskan bekerja secara muafakat ke arah menjadikan FRIM sebuah organisasi terbilang, komited dan berupaya untuk diiktiraf dunia sebagai sebuah institusi penyelidikan hutan tropika di peringkat kebangsaan dan antarabangsa.

proud. We are also in need of the requisite skills of being aggressive by working fast and beyond the norm in keeping up the relevance of FRIM and competence in terms of the mission and aspiration of the Ministry and in line with the Economic Transformation Programmes and New Economic Model of the government. In conclusion, let us continue to work hand-in-hand towards establishing FRIM as an organization that is outstanding, committed and able to be recognized globally as a national and international tropical forest research institute.



**DATO' DR ABU LATIF MOHMOD**  
(DIMP, JSM, KMN, AMN)  
**KETUA PENGARAH/DIRECTOR GENERAL**  
**FRIM**

**CARTA ORGANISASI**  
**ORGANIZATIONAL CHART**





**Visi** Menjadikan FRIM sebuah institusi penyelidikan hutan tropika yang bertaraf dunia

**Vision** To make FRIM a world-class tropical forest research institute

**Misi** Mencapai kecemerlangan dalam penyelidikan saintifik, pembangunan dan perkhidmatan sektor perhutanan

**Mission** To achieve excellence in scientific research, development and forestry services

## Objektif

### Objektif Umum FRIM adalah untuk:

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

### Objektif Operasi FRIM adalah untuk:

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

## Objectives

### General Objectives:

- To generate scientific knowledge for the understanding, management, conservation and use of forest resources
- To achieve excellence in research and development through the use of the latest scientific equipment
- To study biodiversity to produce useful products through intensive research and development
- To develop related technology to fulfill the needs of the forestry industry
- To package research and development findings for dissemination to clients
- To commercialize research and development findings through technology transfer to all interested parties
- To provide excellent service to fulfill client needs
- To create strategic cooperation with local and international agencies
- To raise public awareness regarding the importance of the environment and the conservation of forest biodiversity

### Operational Objectives:

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

# Fungsi

Fungsi utama FRIM adalah untuk:

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

# Functions

The main functions of FRIM are:

- To plan and implement research for the development of the forestry sector and conservation of forest resources
- To obtain and disseminate research information to enhance forest management and the use of forest products
- To establish joint research and joint forest development with other bodies within and outside Malaysia

# Piagam Pelanggan

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

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

# Clients' Charter

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

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

# Dasar Kualiti

FRIM komited dalam menyediakan perkhidmatan penyelidikan dan perkhidmatan sokongan dengan cekap dan berkesan bagi memenuhi keperluan pelanggannya. Ini dilaksanakan berasaskan Piawaian MS ISO 9001:2008. FRIM akan melaksanakan penambahbaikan berterusan bagi meningkatkan keberkesanan sistem berkaitan.

# Quality Policy

FRIM is committed to providing effective research and related supporting services to fulfill its clients' needs. This is carried out in accordance with MS ISO 9001:2008 Standards. FRIM will carry out continuous improvements to enhance the effectiveness of related systems.

Slogan Kualiti Kualiti teras kecemerlangan  
Inovasi kunci keunggulan

Quality Slogan Quality is the pillar for excellence  
Innovation is the key to preeminence

Slogan QE Persekitaran berkualiti pemangkin kecemerlangan  
produktiviti

QE Slogan Quality environment as catalyst to excellence  
in productivity

## PENGURUSAN TERTINGGI SENIOR MANAGEMENT



Ketua Pengarah/**Director General**  
DATO' DR ABD LATIF MOHMOD  
DIMP, JSM, KMN, AMN

Timbalan Ketua Pengarah  
(Penyelidikan dan Pembangunan)  
**Deputy Director General**  
(Research and Development)  
DATO' DR ABDUL RASHID  
HJ AB MALIK  
DIMP

Timbalan Ketua Pengarah (Operasi)  
**Deputy Director General**  
(Operational)  
DR ABDUL RAHIM NIK  
KMN, AMN, JSM

Pengarah Bahagian Perhutanan  
dan Alam Sekitar  
**Director Forestry and**  
**Environment Division**  
DR SHAMSUDIN IBRAHIM  
AMN

Pengarah Bahagian  
Keluaran Hutan  
**Director Forest Products**  
**Division**  
DR MOHD NOR MOHD  
YUSOFF  
KMN

Pengarah Bahagian  
Bioteknologi Perhutanan  
**Director Forest Biotechnology**  
**Division**  
DR NORWATI MUHAMMAD

Pengarah Bahagian  
Biodiversiti Hutan  
**Director Forest**  
**Biodiversity Division**  
DR SAW LENG GUAN



Pengarah Bahagian  
Tumbuhan Ubatan  
**Director Medicinal Plants  
Division**  
DR RASADAH MAT ALI, AMP



Pengarah Bahagian Perancangan  
Penyelidikan dan Korporat  
**Director Research Planning and  
Corporate Division**  
DR NORINI HARON, AMN



Pengarah Bahagian Sumber  
Manusia  
**Director Human Resource Division**  
PUAN WAN RAHMAH WAN ABDUL  
RAOF, KMN



Pengarah Bahagian Kewangan  
**Director Finance Division &**  
Pengarah Bahagian Inovasi dan  
Komersialisasi  
**Director Innovation and  
Commercialization Division**  
EN MOHD ZAMSHARI ABD  
RAHMAN



Pengarah Bahagian  
Pentadbiran dan  
Penyelenggaraan  
**Director  
Administration and  
Maintenance Division**  
EN ABDUL JABBAR  
SABLI



Pengarah Bahagian  
Perkhidmatan  
Teknikal  
**Director Technical  
Services Division**  
DR MOHD DAHLAN  
JANTAN



Ketua Pusat Penemuan  
Ubatan  
**Head Drug Discovery  
Centre**  
DR GETHA  
KRISHNASAMY

# AKTIVITI UTAMA R&D

## R&D HIGHLIGHTS

### R&D Hulan

#### Pengenalan

Tahun 2010 telah menampakkan hasil dan usaha yang berterusan beberapa projek hulan termasuk penggunaan pendekatan inovatif untuk memahami, mengurus dan menggunakan spesies pokok yang berkepentingan ekonomi: teknologi hiperspektra untuk pengecaman dan pemetaan ramin (*Gonystylus bancanus*) di dalam hutan paya gambut, penghasilan klon superior (*Labisia pumila*) untuk penghasilan stok tanaman massa serta kaedah inokulasi pokok karas (*Aquilaria* spp.) untuk penghasilan gaharu dan minyak gaharu. Pemerhatian fenologi, pengutipan dan germinasi anak-anak pokok liar spesies paya laut (i.e. *Avicennia* spp., *Rhizophora* spp., *Sonneratia* spp.) telah dimulakan untuk memenuhi permintaan stok penanaman bagi projek-projek pemuliharaan negara. Usaha yang sekian lama dijalankan oleh penyelidik FRIM dalam pengutipan dan pencirian pokok di seluruh Semenanjung Malaysia sejak 2005 telah menghasilkan penerbitan utama seperti Flora Peninsular Malaysia Siri I (*Ferns and Lycophytes*) dan II (*Seed Plants*), dan Senarai Pokok Data Merah Malaysia yang memerihalkan taburan dan status pemeliharaan 155 spesies dipterokarpa di Semenanjung Malaysia. Sekurang-kurangnya lima spesies baharu ditemui dan pokok-pokok endemik telah dikutip dalam proses ini. Pemantauan jangka panjang juga telah dibuktikan penting dalam usaha-usaha pemeliharaan seperti kejayaan memulihara kawasan tarikan (*puddling*) bagi spesies kupu-kupu yang endemik dan ikonik di Malaysia, "Rajah Brooke's Birdwing" (*Trogonoptera brookiana*). Para hidrologis FRIM juga sedang membantu jabatan perhutanan di Malaysia untuk memantau kualiti air di hutan simpanan kekal (HSK) di Kedah, Perak dan Johor. Satu lagi projek yang penting telah dijalankan iaitu menilai impak sosio-ekonomi berkaitan dengan program-program pemeliharaan hutan paya laut.

#### **Penghasilan Peta Taburan Ruang *Gonystylus bancanus* (Ramin) Menggunakan Teknologi Hiperspektra dan Penentuan Kadar Pengusahaan Berterusan Ramin di Hutan Pengeluaran**

Projek ini merupakan tindakan susulan setelah ramin dicadangkan untuk dimasukkan sebagai spesies terancam dalam Apendiks II Konvensyen Perdagangan Antarabangsa ke atas Spesies Terancam Flora dan Haiwan Liar (CITES) semasa Mesyuarat Pakar, Organisasi Balak Tropika Antarabangsa (ITTO) pada 16–19 Mei 2006 yang diadakan di Kuala Lumpur. Dalam mesyuarat tersebut Malaysia mencadangkan agar FRIM menjalankan kajian berkaitan keadaan biologi dan ekologi pokok ramin bagi memastikan spesies ini dapat dipelihara dan dipulihara secara mampan (ITTO 2007). Projek yang dibiayai oleh ITTO-CITES ini bertujuan untuk menggalakkan aktiviti pemuliharaan dan pengurusan *G. bancanus* secara mampan di hutan pengeluaran Malaysia.

Projek ini mempunyai dua objektif iaitu, (i) untuk menghasilkan peta taburan kedudukan *G. bancanus* melalui penggunaan

### Upstream R&D

#### Introduction

The year 2010 saw the continuous efforts and completion of some important upstream projects including using innovative approaches to better understand, manage and utilize economically important plant species; hyperspectral technology to identify and map ramin (*Gonystylus bancanus*) in peat swamp forests; production of superior kacip fatimah (*Labisia pumila*) clones for mass production; and inoculation methods for the production of gaharu and oil from karas trees (*Aquilaria* spp.). Phenological observations, collections and germinations of wild mangrove tree species seedlings (i.e. *Avicennia* spp., *Rhizophora* spp., *Sonneratia* spp.) have also been initiated to help meet planting stock demands for the use in mangrove rehabilitation efforts nationwide. The long-term efforts by FRIM researchers in conducting and describing plant collections throughout Peninsular Malaysia since 2005 have also resulted in major publications such as the *Flora Peninsular Malaysia Series I (Ferns and Lycophytes)* and *Flora Peninsular Malaysia Series II (Seed Plants)*, and the *Malaysia Plant Red List* which details the distribution and conservation status of 155 dipterocarp species in Peninsular Malaysia. At least five new species were discovered and endemic plants were collected during the process. Long-term monitoring was proven crucial for better conservation measures such as shown in the rehabilitation of puddling sites for "Rajah Brooke's Birdwing" (*Trogonoptera brookiana*), an endemic and iconic Malaysian butterfly species. Similarly FRIM hydrologists are assisting the Malaysian Forestry Department in monitoring the water quality in permanent reserved forests (PRF) in Kedah, Perak and Johor. Another important project was also conducted to assess the socio-economic impacts related to mangrove rehabilitation programmes.

#### **Generation of Spatial Distribution Maps of *Gonystylus bancanus* (Ramin) Using Hyperspectral Technology and Determination of Sustainable Level of Harvest of Ramin in Production Forests**

This project was a follow-up action after ramin was included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), during the ITTO Expert Meeting on the Effective Implementation of the Inclusion of ramin (*Gonystylus* spp.) on 16–19 May 2006 held in Kuala Lumpur. In the meeting Malaysia recommended FRIM to take a lead to undertake studies related to biological and ecological of ramin (*Gonystylus* spp.) in order to ensure the conservation and sustainable management of this species (ITTO 2007). This ITTO-CITES funded project was aimed at encouraging conservation activities and the sustainable management of *G. bancanus* in Malaysia's production forest.

The project had two objectives, (i) to generate spatial distribution maps in Peninsular Malaysia through the use of hyperspectral technology and non-spatial information on *G. bancanus* in a cost-effective manner and (ii) to enhance

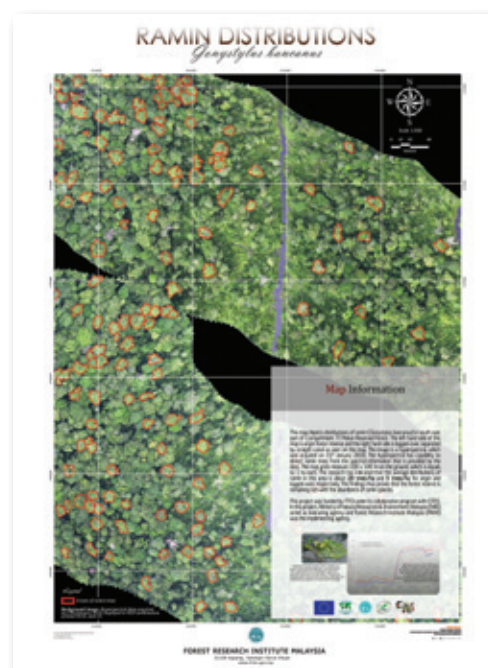
teknologi hiperspektra dan maklumat bukan ruang (spatial) dengan kos yang efektif dan (ii) untuk meningkatkan pemeliharaan dengan menentukan tahap pengusahaan berterusan *G. bancanus* di hutan pengeluaran Semenanjung Malaysia. Projek ini adalah amat penting sebagai satu tindakan mengemas kini penemuan projek-projek terdahulu, terutama yang berkaitan dengan status semasa kadar pertumbuhan, keadaan biologi dan ekologi *G. bancanus*.

Projek ini secara langsung menyokong pelaksanaan Pengurusan Hutan Secara Berkekalan (PHSB) di dalam negara ini dan menjurus ke arah pelaksanaan Konvensyen Kepelbagaian Biologi. Aktiviti-aktiviti yang dijalankan di dalam projek ini adalah selaras dengan polisi kebangsaan bagi pemeliharaan kepelbagaian biologi dan tanah berpaya. Projek ini juga didapati selari dengan keputusan Projek Hutan Paya Gambut (2008) yang diterajui oleh Kerajaan Malaysia, di bawah pembiayaan *United Nations Development Programme/Global Environment Facility (UNDP/GEF)*, baru-baru ini yang mensasarkan kepada pelan pembangunan dan pelaksanaan yang menggalakkan proses ke arah menjamin penggunaan berkekalan dan pemeliharaan hutan paya gambut.

Berdasarkan profil hutan paya gambut, ramin diklasifikasikan sebagai pokok berlapisan kanopi. Profil ini memberi satu kelebihan untuk mengenal pasti *G. bancanus* menggunakan teknologi penderiaan jauh berasaskan data hiperspektra. Kajian ini melibatkan penggunaan data hiperspektra yang dicerap dari ruang udara. Maklumat ini akan dibandingkan dengan maklumat lapangan yang dicerap menggunakan alat pengukuran spektrum (spektoradiometer) dan berdasarkan maklumat tersebut, satu teknik akan dibangunkan untuk mengenal pasti taburan pokok *G. bancanus* menggunakan data hiperspektra ini. Selain itu, kajian ini juga akan mengumpul maklumat berkaitan ekologi ramin bagi penentuan dinamik populasi spesies ini. Kesemua maklumat ini akan diguna pakai bagi menghasilkan pelan penentuan kadar pengusahaan berkekalan *G. bancanus* di hutan paya gambut.

Projek dua tahun ini yang bermula pada November 2008 telah tamat pada Disember 2010. Berikut merupakan output utama yang terhasil:

- Perpustakaan spektra *G. bancanus* telah dibangunkan. Maklumat ini amat berguna untuk memisahkan *G. bancanus* daripada pelbagai spesies lain di dalam persekitaran hutan paya gambut.
- Peta taburan ruang (spatial) dan juga pangkalan data bukan ruang (non-spatial) bagi *G. bancanus* telah ditubuhkan. Peta yang dihasilkan mempunyai ketepatan 86% yang boleh diterima pakai dan boleh digunakan untuk perancangan sumber asli di dalam kawasan hutan. Prosedur yang diperkenalkan juga boleh dipanjangkan ke seluruh kawasan hutan paya gambut bagi pemetaan populasi *G. bancanus* di dalam persekitaran semula jadi.
- Kedinamikan populasi *G. bancanus* di dalam Hutan Simpan Pekan ditentukan. Ia juga termasuk impak penebangan kepada dirian berhampiran. Maklumat sedemikian berguna untuk meramal kadar pertumbuhan dan tumbesaran *G. bancanus* dalam keadaan semula jadi di dalam hutan dara dan juga bekas pembalakan.
- Tahap penebangan secara berkekalan bagi *G. bancanus*



Peta taburan ramin yang terhasil daripada imej hiperspektra  
Map of ramin distributions as derived from hyperspectral image

conservation by determining sustainable level of harvest for *G. bancanus* in production forests of Peninsular Malaysia. This project supported the implementation of Sustainable Forest Management (SFM) in this country and worked towards the implementation of the Convention on Biological Diversity. The activities of the project were also in line with the national policies for biological diversity and wetlands conservation.

Based on the peat swamp forest profile, *G. bancanus* can be classified as a canopy layer tree. This profile gives an advantage to identify *G. bancanus* using remote sensing technology based on hyperspectral data. This study involved the use of hyperspectral data that was acquired from airspace. This information was compared with the information from field observation using the spectrum measurement instrument (Spectroradiometer) and based on that information a technique was developed to identify *G. bancanus* tree distribution using this hyperspectral data. Besides, this study also combined all the relevant ramin ecological information for determination of this species' population dynamics. All this information has been used for determining the sustainable level of harvest for *G. bancanus* in peat swamp forest.

This two years' project which started in November 2008 was completed in December 2010. The following four outputs were produced indicating the achievement of the two objectives mentioned above:

- Spectral signature library of *G. bancanus* developed. The information is useful in discriminating *G. bancanus* from other tree species in the mixed peat swamp forest environment.
- Spatial distribution maps and non-spatial database of *G. bancanus* established. The map produced has acceptable 86% accuracy and can be used for resource planning in the forest area. The procedure can be extended to the entire peat swamp forest for mapping of *G. bancanus* population in the natural environment.

di dalam hutan pengeluaran bagi Hutan Simpan Pekan ditentukan. Berdasarkan kedinamikan populasi dan tahap penebangan yang telah diukur, maka kadar penggunaan *G. bancanus* dapat dilaksanakan secara berkekalan.

Tiga aktiviti pemindahan teknologi dan latihan telah diadakan dalam tempoh pelaksanaan projek dengan penyertaan tidak kurang daripada 80 peserta dari pelbagai agensi kerajaan, badan swasta, badan bukan kerajaan (NGO) dan juga universiti. Aktiviti pemindahan teknologi yang paling mendapat perhatian ialah Bengkel Serantau yang diadakan di Kuantan dari 1–4 Disember, dihadiri oleh 61 peserta termasuk 11 delegasi dari Indonesia untuk berkongsi penemuan dan juga pengalaman yang terhasil daripada beberapa aktiviti projek di bawah tajaan ITTO-CITES.

Projek ini juga telah menghasilkan 11 penerbitan dalam bentuk buku, artikel di dalam jurnal, prosiding dan juga laporan. Kesemua penerbitan ini boleh dijadikan rujukan berguna bagi kumpulan sasaran termasuklah institusi penyelidikan, komuniti perhutanan, organisasi bukan kerajaan, pelajar-pelajar dan juga masyarakat umum. Segala pencapaian yang terhasil daripada projek ini secara langsung telah menyumbang ke arah pengurusan secara semula jadi yang lebih mampan dari segi pemeliharaan dan juga penggunaan berterusan bagi *G. bancanus*.

- c) Population dynamics of *G. bancanus* in Pekan FR determined. It also includes impacts of harvesting to the residual stands. The information is useful to predict growth and increment of *G. bancanus* in its natural stands of virgin and logged-over forests.
- d) Sustainable harvest levels of *G. bancanus* in natural production forests in Pekan FR determined. Based on the population dynamics and sustainable harvest information, utilization of *G. bancanus* can be undertaken sustainably.

Three training and transfer of technology activities were conducted throughout the project period with the participation of not less than 80 participants from various government agencies, the private sector, NGOs and universities. The highlight of these activities was the organization of Regional Workshop on 1–4 December in Kuantan attended by 61 participants including 11 delegates from Indonesia to share project findings as well as experiences in undertaking various project activities funded by ITTO-CITES.

The project also successfully produced 11 publications in the form of books, articles in journals, proceedings and reports. All the results achieved in this project can be used as useful reference by target groups including research institutions, forestry communities, non-governmental organizations, students and the general society. The outcomes from the activity have definitely contributed towards better improvement of managing *G. bancanus* in the natural environment for both conservation and sustainable use.



Pemasangan sistem Airborne HySpex VNIR 1600 di dalam pesawat  
Airborne HySpex VNIR 1600 systems installations onboard

## Penubuhan Germplasma *Labisia pumila* (Kacip Fatimah)

*Labisia pumila* atau kacip fatimah telah lama dikenali kerana mempunyai nilai-nilai perubatannya dan kini sedang digunakan secara meluas sebagai makanan tambahan kesihatan. Kacip fatimah merupakan salah satu ramuan utama dan paling popular digunakan untuk penyediaan jamu selepas bersalin. Dengan permintaan yang semakin bertambah sebagai sumber bagi pembuatan produk farmaseutikal dan permintaan tinggi terhadap produk herba di Malaysia, permintaan terhadap bahan mentahnya juga meningkat. Di Malaysia, kebanyakan tumbuhan ubatan dikutip secara liar dan hanya sedikit ditanam. Tiada kerja pembiakbakaan tanaman dilakukan terhadap spesies ini terutamanya untuk mengenal pasti baka berkualiti dan berkuantiti tinggi sebelum didomestikasi. Oleh itu, satu kajian telah dijalankan untuk menyaring dan memilih baka yang mempunyai jumlah kandungan fenolik yang tinggi bagi dua varieti *L. pumila*.

Pemilihan baka bagi dua varieti *L. pumila* (var. *alata* dan var. *pumila*) daripada 10 populasi telah dilakukan. Populasi untuk varieti *alata* ialah (1) H.S. Gunung Inas, Kulim, Kedah, (2) H.S. Bukit Larut, Taiping, Perak, (3) H.S. Pasoh, Pasoh, N. Sembilan (4) H.S. Panti, Panti, Johor dan (5) H.S. Tekai, Jerantut, Pahang, manakala populasi untuk varieti *pumila* ialah 1) H.S. Gunung Inas, Kulim, Kedah, (2) H.S. Pondok Tanjung, Taiping, Perak, (3) H.S. Tembat, Kuala Berang, Terengganu, (4) H.S. Sungai Nipah, Kemaman, Terengganu dan (5) H.S. Batu Papan, Gua Musang, Kelantan. Sebanyak 30 pokok ibu dikutip daripada setiap populasi untuk setiap varieti. Bagi pengekstrakan mentah, sebanyak 50 g sampel daun bagi setiap pokok dipotong kecil dan direndam di dalam 95% ETOH (1:3) 300.0 ml selama 48 jam. Manakala jumlah kandungan fenolik ditentukan menggunakan kaedah Folin-Ciocalteu.

Nilai jumlah kandungan fenolik bagi ekstrak daripada varieti *pumila* adalah antara 1720.77 hingga 2927.79 mg gallic acid equivalent (GAE)<sup>-1</sup> dan sebanyak 633.65 hingga 2792.57 mg GAE<sup>-1</sup> bagi var. *alata*. Keputusan menunjukkan terdapat perbezaan bererti pada purata kandungan fenolik antara kedua-dua varieti. Varieti *pumila* merekodkan keputusan yang lebih tinggi iaitu 2523.54±25.805 mg GAE<sup>-1</sup> berbanding hanya 1759.76±66.759 mg GAE<sup>-1</sup> bagi var. *alata*. Keputusan saringan antara populasi bagi var. *pumila* menunjukkan perbezaan bererti bagi populasi 1 (1957.91 mg GAE<sup>-1</sup>) dan populasi 2 (2677.25 mg GAE<sup>-1</sup>), 3 (2688.27 mg GAE<sup>-1</sup>), 4 (2681.88 mg GAE<sup>-1</sup>) dan 5 (2612.38 mg GAE<sup>-1</sup>). Manakala bagi var. *alata*, populasi 3 dan 2 memberikan jumlah kandungan fenolik tertinggi iaitu masing-masing sebanyak 2680.79 dan 2544.11 mg GAE<sup>-1</sup>. Kedua-dua populasi ini adalah berbeza secara bererti dengan populasi 1 (1415.50 mg GAE<sup>-1</sup>), 4 (971.42 mg GAE<sup>-1</sup>) dan 5 (1186.98 mg GAE<sup>-1</sup>).

Berdasarkan saringan jumlah kandungan fenolik, masing-masing sebanyak 57 dan 63 daripada 150 pokok telah dipilih bagi varieti *alata* dan *pumila*. Pokok-pokok ini telah dilakukan perambatan tampang secara keratan bagi menghasilkan klon-klon yang superior. Satu germplasma yang mengandungi 1500 pokok telah berjaya ditubuhkan di bawah keadaan semula jadi di FRIM. Dengan adanya germplasma ini, penghasilan stok tanaman secara massa dapat dilakukan bagi memenuhi permintaan daripada industri tempatan pada masa hadapan.

## Establishment of *Labisia pumila* (Kacip Fatimah) Germplasm

*Labisia pumila* (Myrsinaceae), or kacip fatimah, has long been recognized for its medicinal value and is widely available commercially as health supplements. It is one of the most popular and potent ingredients used in traditional herbal preparations or *jamu* for postnatal care. With the growing interest in *L. pumila* as a source of new pharmaceutical products and the increasing demand for herbal products in Malaysia, the demand for its raw materials is also increasing. In Malaysia, medicinal plants are generally collected from the wild and a few are cultivated. No proper plant improvement work has been done on this species especially to identify high quality and quantity yielding plants before it can be domesticated. Thus, a study was carried out to screen and select plants of high total phenolic content in two varieties of *L. pumila*.

Selection of high yielding genotypes of two varieties of *L. pumila* (var. *pumila* and var. *alata*) from 10 populations has been undertaken. The populations for var. *alata* were, (1) Gunung Inas F.R., Kulim, Kedah, (2) Bukit Larut F.R., Taiping, Perak, (3) Pasoh F.R., Pasoh, Negri Sembilan (4) Panti F.R., Panti, Johor and, (5) Tekai F.R., Jerantut, Pahang, whereas populations for var. *pumila* were (1) Gunung Inas F.R., Kulim, Kedah, (2) Pondok Tanjung F.R., Taiping, Perak, (3) Tembat F.R., Kuala Berang, Terengganu, (4) Sungai Nipah F.R., Kemaman, Terengganu and (5) Batu Papan F.R., Gua Musang, Kelantan. Thirty mother plants were collected from each population for each variety. For crude extraction, about 50 gram of leaf samples from each mother plants were cut into small pieces and soaked in 95% ETOH (1:3) 300.0 ml for 48 h. The total phenolic content was determined using Folin-Ciocalteu method.

The total phenolic contents of the var. *pumila* extracts ranged from 1720.77 to 2927.79 mg gallic acid equivalent (GAE)<sup>-1</sup> of extracts and those of the var. *alata* extracts ranged from 633.65 to 2792.57 mg GAE<sup>-1</sup> of extracts. Results indicated that there was a significant difference between the average phenolic contents of the two varieties. Var. *pumila* recorded higher at 2523.54±25.805 mg GAE<sup>-1</sup> as compared with only 1759.76±66.759 mg GAE<sup>-1</sup> for var. *alata*. Screening result between population for both varieties showed that for var. *pumila*, there was significant difference between populations 1 (1957.91 mg GAE<sup>-1</sup>) and 2 (2677.25 mg GAE<sup>-1</sup>), 3 (2688.27 mg GAE<sup>-1</sup>), 4 (2681.88 mg GAE<sup>-1</sup>) and 5 (2612.38 mg GAE<sup>-1</sup>). For var. *alata*, populations 3 and 2 produced the highest total phenolic contents at 2680.79 and 2544.11 mg GAE<sup>-1</sup> respectively. These were significantly different from populations 1 (1415.50 mg GAE<sup>-1</sup>), 4 (971.42 mg GAE<sup>-1</sup>) and 5 (1186.98 mg GAE<sup>-1</sup>).

Based on the total phenolic content screening, 57 and 63 out of 150 plants were selected for var. *alata* and var. *pumila* respectively. These materials were propagated through vegetative cutting propagation method for the production of superior clones. A germplasm of 1500 plants has been successfully established under natural condition in FRIM. By having this germplasm, mass production of *L. pumila* planting stock to fulfill the future demand of herbal industries in the country is possible.



Penubuhan germplasma kacip fatimah di FRIM  
 Germplasm of kacip fatimah established in FRIM



Kacip fatimah—pokok berhasil tinggi  
 High yielding plants of kacip fatimah

## Penanaman dan Pengurusan Karas bagi Pengeluaran Gaharu/Minyak Gaharu

### Penanaman

Perusahaan perladangan spesies bukan kayu (NTFP) semakin mendapat perhatian organisasi swasta dan individu bagi tujuan pengeluaran gaharu (agarwood), minyak gaharu dan produk berkaitan kesihatan. Penanaman spesies pokok karas yang berpotensi lebih bertumpu pada spesies seperti *Aquilaria malaccensis*, *A. hirta*, *A. beccariana*, *A. crassna*, *A. subintegra* dan *A. sinensis*. Antara sebabnya ialah tumbesarnya yang cepat, kesesuaian tanah, menghasilkan minyak berkualiti dan anak benih yang mudah diperolehi. Kini gaharu telah dikenal pasti untuk ditanam di bawah ladang hutan anjuran Kementerian Perusahaan Perladangan dan Komoditi (KPPK) secara perhutanan tani atau secara tunggal. Dianggarkan seluas 1500 ha telah ditanam yang melibatkan pihak swasta seperti Lembaga Industri Kayu-Kayan Malaysia (MTIB), Jabatan Perhutanan, FRIM serta individu dan syarikat. Dengan teknologi yang lebih efektif, pengeluaran gaharu dan minyak

## Cultivation and Management of Karas for the Production of Agarwood (Gaharu) and Oil

### Cultivation

Non-timber forest products (NTFPs) derived from industrial forest plantation species such as agarwood (gaharu), oil and other health related products are gaining attention from both private organizations and individuals. Intense interest is seen in the cultivation of karas (*Aquilaria*) tree species such as *Aquilaria malaccensis*, *A. hirta*, *A. beccariana*, *A. crassna*, *A. subintegra* and *A. sinensis*. Among the reasons are the fast growth rates, suitability in most soils, production of high quality oil and easy availability of the planting stocks. Currently, karas is being recognized for cultivation as forest plantation by the Ministry of Plantation and Commodity (MPIC) under agroforestry or mono-crop cultivation. It is estimated that there are about 1800 ha of karas plantation being cultivated, involving government agencies like the Malaysian Timber Industry Board (MTIB), Forestry Department, FRIM, individuals and private companies. With the application of effective technology, the production of gaharu and oil can be

gaharu boleh diperolehi dalam masa umur yang singkat, antara 8–10 tahun. Gaharu merupakan komoditi produk bukan kayu yang penting dan bernilai tinggi dari segi eksport, namun dalam jumlah kuantiti/nilai masih kecil di dalam ekonomi negara. Hasil percubaan penyelidikan yang sedang dijalankan di FRIM jelas menunjukkan spesies tempatan utama, *A. malaccensis* mempunyai tumbesaran yang cepat dan sesuai ditanam di kebanyakan jenis tanah. Memandangkan permintaan gaharu yang tinggi dan tujuan pengawalan, semua spesies pokok karas daripada genus *Aquilaria/Gyrinops* telah disenaraikan di bawah *Appendix II CITES (Convention on International Trade on Endangered Species) 2002*. Ini akan menjamin penawaran bahan tanaman pokok yang berkekalan di samping boleh menampung permintaan yang sentiasa meningkat.

Secara keseluruhan, perusahaan untuk pengeluaran gaharu masih di peringkat awal, dan beberapa teknologi dalam peringkat percubaan menggunakan pelbagai spesies tersebut. Di FRIM, percubaan giat dijalankan dengan pelbagai teknik yang efektif dari dalam dan luar negara bagi tujuan pengeluaran gaharu menggunakan dirian yang ditubuhkan secara perladangan.

obtained within a short rotation age, estimated between 8 and 10 years old. Gaharu is one of the important commodities among non-wood forest products and is highly valued in terms of export although the total quantity/value contribution is comparatively small in the country's economy. On-going research carried out in FRIM clearly shows that the main local species of *A. malaccensis* has fast growth rate and is suitable for cultivation in most soils. Due to the high demand and for conservation purposes, all tree species derived from the genus *Aquilaria/Gyrinops* are classified under *Appendix II CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) 2002*. This will ensure the sustainable supply of the planting stocks while maintaining the increasing demands.

In conclusion, the gaharu industry for the production of gaharu is still at the initial stage and there are several experimental inoculation technologies being carried out using different tree species. In FRIM, several trials have been carried out using different effective techniques sourced both locally and overseas for the production of gaharu in the cultivated stands.



Penanaman karas dan percubaan teknik inokulasi efektif di Ladang Hutan Percubaan FRIM  
Cultivated karas plantations and on-going experimental trials for effective inoculation technique in FRIM's Forest Plantation

## Pengurusan Hutan Ladang

Karas berupaya hidup dan ditanam secara terbuka, di atas kawasan pelbagai jenis tanah, yang biasa sehingga di kawasan miskin (marginal) dan terbiar kecuali di kawasan berair. Keperluan taburan hujan adalah antara 2000–3000 mm setahun dengan suhu antara 25–32 °C. Jarak tanaman yang biasa dipraktikkan ialah 3 x 3 m dan pembajaan secara organik atau kimia boleh digunakan. Kawalan rumpai boleh dilakukan menggunakan penutup rumpai tanah, racun jenis sentuh, secara manual atau menggunakan mesin pemotong rumput.

## Penginokulatan

FRIM dan beberapa syarikat dari dalam dan luar negara sedang dalam proses percubaan bagi mendapatkan teknik peninokulatan yang efektif untuk pengeluaran gaharu dan minyak. Sehingga hari ini, teknologi *CA Kit* yang dipaten telah digunakan dan menunjukkan kejayaan dengan dirian pokok berumur 10 tahun.

## Fenologi dan Penghasilan Bahan Tanaman Pokok Bakau

Sepanjang tahun 2010, aktiviti projek yang berjudul “Teknik Penghasilan Bahan Tanaman Spesies Bakau yang Mampu Menampung Permintaan Negara” banyak tertumpu pada pemerhatian fenologi tumbuh-tumbuhan pesisiran pantai di samping pengumpulan anak-anak benih liar terutamanya spesies api-api putih (*Avicennia alba*), berus (*Bruguiera cylindrica*), nyireh bunga (*Xylocarpus granatum*) dan nyireh batu (*Xylocarpus moluccensis*).

Tujuan projek ini adalah untuk menyediakan alternatif kepada kaedah penyediaan stok anak benih bakau yang menggunakan kaedah pengutipan anak benih liar. Usaha menyediakan stok tanaman spesies selain *Rhizophora* seperti *Xylocarpus* dan juga *Bruguiera* melalui penyemaian biji benih merupakan satu cara untuk penyediaan stok anak benih yang diperlukan untuk penanaman. Biji benih nyireh bunga (*Xylocarpus granatum*) dan biji benih berus (*Bruguiera cylindrica*) telah dikutip bagi tujuan ini. Aktiviti ujian percambahan menggunakan media pasir 100% telah dilaksanakan di tapak semaian FRIM. Hasil penyemaian ini menunjukkan bahawa peratusan percambahan biji benih nyireh bunga agak rendah yakni sekitar 20% sahaja berbanding berus yang mampu bercambah sehingga 100%.

Sementara itu, pengumpulan anak benih liar bagi tujuan penyediaan stok tanaman turut dilakukan di Kg Bagan Pasir, Kuala Selangor. Anak-anak benih yang tumbuh secara semula jadi dan mempunyai sekurang-kurangnya 2–4 helai daun, disediakan bebola akar terlebih dahulu sebelum dipindahkan ke dalam polibeg berukuran 30 cm x 30 cm (12” x 12”).

Pemerhatian fenologi masih diteruskan lagi di sepuluh kawasan iaitu Kuala Sepetang, HS Matang, Perak; Kuala Gula, Taiping, Perak; Pantai Remis, HS Tanjung Hantu, Perak; Setiawan, Perak; Pulau Burong, Nibong Tebal, Pulau Pinang; Taman Alam Kuala Selangor, Selangor; Pulau Carey, Kuala Langat, Selangor; Port Dickson, Negeri Sembilan; Sungai Udang, Teluk Gong, Melaka dan Tanjung Sepat, Port Dickson, Negeri Sembilan. Spesies yang diperhatikan di tempat-tempat

## Management of Forest Plantation

Karas (*Aquilaria*) can thrive and grow well in the open, on various soil types, from normal to poor marginal soils, and abandoned lands except in water-logged areas. It requires rainfall of between 2000 and 3000 mm per year with temperature range of 25–32 °C. Normal planting distance of 3 x 3 m is recommended and organic or inorganic fertilizer can be applied. Weed control can be done using ground-cover crops, contact weedicides and either manually or using grass cutter.

## Inoculation

FRIM and incooperation with several research companies/ individuals both local and overseas is in the process of testing and acquiring the most effective techniques for the production of gaharu and oil. To date, a patented technology using *CA Kit* has been tested and successfully produced on the 10-year-old stands.

## Phenology and Planting Materials of Mangrove Vegetation

Throughout 2010, the activities in the project titled “Techniques of Producing Mangrove Planting Materials to Fullfill National Demand” focused mainly on phenological observations of plants in the coastal areas besides the collection of wild seedlings, especially for the species api-api putih (*Avicennia alba*), berus (*Bruguiera cylindrica*), nyireh bunga (*Xylocarpus granatum*) and nyireh batu (*X. moluccensis*).

The objective of this study is to find alternatives to the traditional wilding collection for provisions of planting material of mangrove species. Planting stocks of species besides *Rhizophora*, such as *Xylocarpus* and *Bruguiera* through seed germination is a way of providing stocks to fulfill the demand for planting. Seeds of nyireh bunga (*X. granatum*) and berus (*B. cylindrica*) were collected and germination tests were conducted at FRIM’s nursery. Results indicated that nyireh seeds yielded very low germination rates at around 20% compared with the 100% rate of berus.

The collection of wild seedlings for the purpose of planting stock was also conducted at Kg Bagan Pasir, Kuala Selangor. The naturally germinated seedlings with 2–4 leaves were transferred to polybags of 30 cm x 30 cm (12” x 12”) size, after being rootballed.

Phenological observations are still being conducted at ten areas, i.e. Kuala Sepetang, Matang FR, Perak; Kuala Gula, Taiping, Perak; Pantai Remis, Tanjung Hantu FR, Perak; Setiawan, Perak; Pulau Burong, Nibong Tebal, Pulau Pinang; Taman Alam Kuala Selangor, Selangor; Pulau Carey, Kuala Langat, Selangor; Port Dickson, Negeri Sembilan; Sungai Udang, Teluk Gong, Melaka and Tanjung Sepat, Port Dickson, Negeri Sembilan. Observed species for the phenological study were *Avicennia alba*, *A. marina*, *A. officinalis*, *Bruguiera parviflora*, *Ceriops tagal*, *Rhizophora apiculata*, *R. mucronata*, *Sonneratia alba*, *S. ovate*, *Talipariti tilaceum*, *Xylocarpus granatum*, *X. moluccensis*, *Callophyllum inophyllum* and *Sonneratia caseolaris*. Most of the species being monitored

yang dinyatakan di atas ialah *Avicennia alba*, *A. marina*, *A. officinalis*, *Bruguiera parviflora*, *Ceriops tagal*, *Rhizophora apiculata*, *R. mucronata*, *Sonneratia alba*, *S. ovate*, *Talipariti tilaceum*, *Xylocarpus granatum*, *X. moluccensis*, *Callophylum inophyllum* dan *Sonneratia caseolaris*. Secara umumnya kebanyakan spesies yang dipantau didapati berbunga serentak pada bulan Mei hingga Oktober 2010. Walau bagaimanapun, terdapat juga sebahagian daripada spesies-spesies ini yang berbunga dan berbuah sepanjang tahun seperti *R. apiculata*, *T. tilaceum* dan *C. inophyllum*.

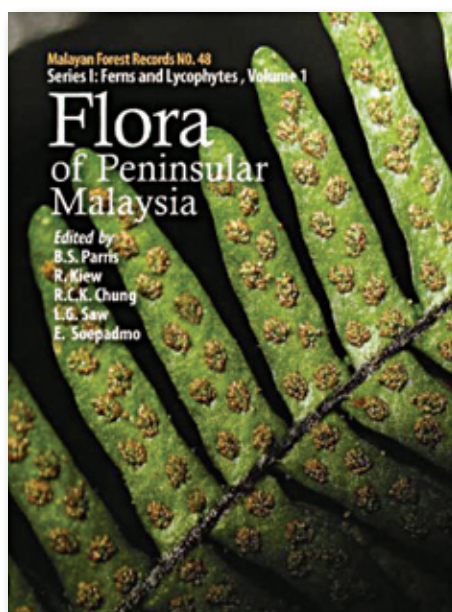
### Flora Semenanjung Malaysia

Projek Flora Semenanjung Malaysia bermula pada tahun 2005 dengan dibiayai oleh Kementerian Sains, Teknologi dan Inovasi (MOSTI) melalui Majlis Penyelidikan dan Kemajuan Sains Negara (MPKSN) selama lima tahun. Projek ini menghasilkan dokumentasi lengkap, terkini dan komprehensif untuk 8300 tumbuhan vaskular berpandukan penyelidikan asal dalam dua siri. Siri pertama ialah *Ferns and Lycophytes* manakala siri kedua ialah *Gymnosperms and Flowering Plants*. Jilid pertama *Flora Series 1 Ferns and Lycophytes* mengandungi semakan tulen 100 spesies, 21 genera dan sembilan famili manakala jilid pertama *Flora Series II Seed Plants* mengandungi semakan untuk 81 spesies, 35 genera dan 26 famili. Kedua-dua siri ini telah diterbitkan pada 2010 yang turut menyediakan kekunci pengecaman untuk kesemua famili dan turut memuatkan rumusan berkenaan famili-famili yang dikenal pasti di Semenanjung Malaysia yang berpandukan kajian-kajian molekular moden. Siri 1, jilid 1 ialah hasil usahasama antara ahli-ahli taksonomi di FRIM (tiga famili), universiti tempatan (lima famili) dan institusi antarabangsa (satu famili), manakala siri 2, jilid 1 ialah hasil usahasama antara ahli-ahli taksonomi di FRIM (23 famili) dan institusi antarabangsa (empat famili). Kedua-dua Flora ini diilustrasikan sepenuhnya dengan lukisan botani dan gambar berwarna. Elemen baharu bagi Flora Semenanjung Malaysia yang turut dimuatkan di dalam buku ini ialah peta taburan dan status pemuliharaan bagi setiap spesies. Ini memberi sumbangan terhadap pencapaian matlamat mendokumentasikan kepelbagaian biologi dan membekalkan data asas bagi pengurusan dan pemuliharaan kepelbagaian tumbuhan. Tiga spesies baharu telah ditemui dalam semakan taksonomi bagi kedua-dua jilid ini. Komponen penting bagi Flora ini ialah latihan bagi membentuk generasi baharu ahli-ahli taksonomi.

were found to be flowering simultaneously from May to October. However, there were some species observed to be fruiting throughout the year such as *R. apiculata*, *T. tilaceum* and *C. inophyllum*.

### The Flora of Peninsular Malaysia

The Flora of Peninsular Malaysia Project begun in 2005 with initial funds from the Ministry of Science, Technology and Innovation (MOSTI) through the National Council for Scientific Research and Development (MPKSN) for five years. The project produced a complete, updated and comprehensive documentation of about 8300 vascular plant species based on the original research in two series. Ferns and Lycophytes are covered by Series 1 and Gymnosperms and Flowering Plants by Series 2. The first volume of Flora Series 1 Ferns and Lycophytes includes original revisions of 100 species in 21 genera and nine families and Flora Series II Seed Plants consists of revisions for 81 species, 35 genera and 26 families. Both series were published in 2010 and provide a key to identifying all families and an overview of the families recognized in Peninsular Malaysia in the light of modern molecular studies. Series 1, volume 1 is a successful collaboration between taxonomists in FRIM (three families), local universities (five families) and international institutes (one family) while Series 2 is a successful collaboration between taxonomists in FRIM (23 families) and international institutes (four families). Both Flora Series are fully illustrated with both botanical plates and colour photographs. New features of the Malaysian flora include distribution maps and conservation status of the species. This contributes towards the aim of documenting biodiversity and providing baseline data essential for the management and conservation of plant diversity. During the course of revising families in both volumes, three new species were discovered. An important component of the Flora is the training of a new generation of taxonomists.



## Spesies Baharu Gesneriaceae dan Lecythidaceae di Semenanjung Malaysia

Baru-baru ini, lima spesies baharu yang menarik telah dihuraikan dari Semenanjung Malaysia. Spesies-spesies tersebut ialah *Paraboea gracillima* dan *P. lambokensis* dalam famili Gesneriaceae, serta tiga lagi spesies ialah *Barringtonia badia*, *B. glomerata* dan *B. norshamiae* yang tergolong dalam famili Lecythidaceae.

*Paraboea gracillima* dan *P. lambokensis* ialah dua penemuan spesies menarik, masing-masing dari Perlis dan Kelantan. Nama latin bagi spesies terdahulu “*gracillima*” ialah merujuk sifat jambak bunga yang halus dan bercabang banyak, manakala untuk spesies yang kedua, “*lambokensis*” ialah merujuk nama lokaliti batu kapur tempat ia tumbuh. Keduanya hanya dijumpai di bukit batu kapur. Penemuan ini adalah amat penting kerana tahap endemik di kalangan spesies *Paraboea* di Semenanjung Malaysia amatlah tinggi. *Paraboea lambokensis* adalah endemik di Semenanjung Malaysia dan dikategori sebagai Sangat Terancam, manakala *P. gracillima* yang dilindungi di bawah jagaan Taman Negeri Perak adalah dikategori sebagai Sedikit Terancam.

*Paraboea gracillima* dan *P. lambokensis* adalah mudah dibezakan melalui habit, ketinggian, bentuk daun, warna kelopak serta bentuk buah dan keadaan berbulunya. *Paraboea gracillima* ialah setinggi 20 cm, bersifat roset dengan daun berbentuk lebar menirus, kelopak berwarna merah jambu dan berbuah silinder tetapi licin, manakala *P. lambokensis* ialah 50 cm tinggi, bersifat tumbuhan renek dengan daun berbentuk bujur menirus, kelopak berwarna ungu dan buah berpintal serta berbulu. Ketiga-tiga spesies *Barringtonia* yang dinyatakan di atas turut merupakan penemuan yang penting disebabkan spesies-spesies ini adalah endemik kepada Semenanjung Malaysia. Antara ketiga-tiga spesies tersebut, *Barringtonia glomerata* adalah langka kerana spesies ini hanya diketahui melalui koleksi tip dari sempadan Kedah-Perak, manakala dua spesies yang lain adalah agak lazim ditemui. *Barringtonia* atau nama tempatannya “putat” secara umum, kebanyakannya terdiri daripada kumpulan pokok dengan daun tersusun secara berlingkar dan berkelompok pada hujung dahan.

Bagaimanapun, *B. badia* boleh dikenali melalui permukaan bawah daun yang berbulu panjang, bentuk daun seperti spatula iaitu lebih lebar di bahagian atas pertengahan daun;



New species of *Paraboea lambokensis*  
Spesies baharu *Paraboea lambokensis*

## New Species of Gesneriaceae and Lecythidaceae in Peninsular Malaysia

Five new interesting species were described from Peninsular Malaysia recently. They are *Paraboea gracillima* and *P. lambokensis* in family Gesneriaceae, and another three species, *Barringtonia badia*, *B. glomerata* and *B. norshamiae* belonging to family Lecythidaceae.

*Paraboea gracillima* and *P. lambokensis* were discovered from Perlis and Kelantan respectively. The latin name for the former species *gracillima* refers to its inflorescence being very slender and much branched panicle, while for the latter species “*lambokensis*” is referring to the locality of the limestone hills on which it grows. Both species are confined to limestone hills. This finding is very important as endemism is very high among *Paraboea* species in Peninsular Malaysia. *Paraboea lambokensis* is endemic to Peninsular Malaysia and is Critically Endangered while *P. gracillima*, which is protected in the Perlis State Park, is categorized as Least Concern.

*Paraboea gracillima* and *P. lambokensis* are easily differentiated by their habit, height, leaf shape, corolla colour, fruit shape and hairiness. *Paraboea gracillima* is a 20-cm high rosette herb with broadly elliptic leaves, pinkish corolla, straight and glabrous fruits while *P. lambokensis* is a 50-cm high shrubby herb with narrowly elliptic leaves, purple corolla, twisted and minutely hairy fruits. The three species of *Barringtonia* mentioned above are also an important finding as they are all endemic to Peninsular Malaysia. Among of them, *B. glomerata* is rare as it is known only from the type collection from the Kedah-Perak border, while the other two are quite common. *Barringtonia*, or locally known as “putat”, in general are mostly trees and their leaves are spirally arranged and clustered towards the end of branches.

However, *B. badia* can be recognized from its hirsute underside of the leaves, the spatulate shape being much broader well above the midpoint, and in the smaller flowers and broader, larger fruit. For *B. glomerata*, a 10-m high tree is easily identified in its clustered flowers at the tip of the inflorescence rachis, the broader leaves with entire not crenate margins and the abrupt mucro at the apex rather than a long thin acumen. The third one, *B. norshamiae*, which was named after Norsham Yaakob, a student of *Barringtonia* at FRIM, can be identified by its larger ovoid not angled fruit, the much smaller flowers on long pedicels, the much thinner chartaceous leaves that



bunga yang lebih kecil serta buah yang lebih besar dan lebih lebar. Bagi *B. glomerata*, pokok ketinggian 10 m ini mudah dikenali melalui bunga yang berkelompok pada penghujung rakis jambak bunga serta daun yang lebih lebar dengan tepi daun rata dan tidak bergigi serta hujung daun yang meruncing mendadak (tidak mempunyai hujung daun yang meruncing secara beransur-ansur dan panjang). Spesies ketiga, *B. norshamiae* yang dinamakan bersempena Norsham Yaakob, seorang pengkaji *Barringtonia* di FRIM dapat dikenali melalui ciri diagnostiknya iaitu buah yang lebih besar, berbentuk bujur dan tidak bersudut; bunga yang lebih kecil pada tangkai bunga yang panjang; daun yang lebih nipis seperti kertas yang hampir tidak bertangkai dengan margin/ tepi daun yang sedikit bergulung keluar serta pangkal daun yang menirus.

### Ekspedisi Botani ke Gunung Padang, Terengganu

Gunung di Negeri Terengganu dilimpahi banyak spesies tumbuhan yang menarik, iaitu endemik pada sesuatu tempat, namun sehingga kini masih banyak bukit dan gunung belum diterokai. Gunung Padang (N4 50.929 E102 52.042 1315 m di bawah paras laut) terletak di Taman Negara, Terengganu dan fokus ekspedisi botani yang dianjurkan oleh Projek *Flora of Peninsular Malaysia* dari 16–26 Mac disertai oleh penjawat awam FRIM, pengangkut barang dan jurupandu. Sebelum ekspedisi dilaksanakan, Gunung Padang hanya dikunjungi untuk aktiviti botani sebanyak tiga kali sahaja dan jumlah keseluruhan koleksi hanya sekitar 200 spesimen herbarium bagi spesies pokok sahaja. Fokus utama ekspedisi ini ialah membuat tinjauan koleksi lengkap botani termasuk tumbuhan pemanjat, epifit, herba dan paku-pakis dengan tujuan utama membuat koleksi lengkap spesimen berbunga dan berbuah sebagai asas senarai semak tumbuhan secara menyeluruh untuk Gunung Padang.

Sebelum sampai ke puncak, terdapat lima kem iaitu Kem Sungai Chik, Kem Koh, Kem Spring, Kem Sadlewood dan Kem Corybas. Dua kem terakhir yang terletak di permatang tidak mempunyai punca sumber air maka jurupandu telah menggunakan daun *Johannesteijsmannia altifrons* sebagai alat mengumpul air hujan. Kehadiran faktor angin di puncak membentuk populasi pokok yang bersaiz sederhana dengan diameter yang sama termasuklah spesies *Illicium* dan *Syzigium*. Sebelum ke puncak, terdapat tanah berpaya dengan dahan yang berlingkar seperti *Leptospermum flavescens*, *Dacrydium beccarii* and *D. medium* dan *Vaccinium* sp. membentuk kanopi yang terbuka untuk tumbuhan pemanjat seperti *Nepenthes sanguinea* dan *Sphagnum* yang berbentuk karpet berasosiasi dengan pokok tangki, *Utricularia minutissima*.

Sebanyak 525 koleksi tumbuhan telah dikutip—mewakili sebanyak 446 spesies dan 87 famili termasuk 43 spesies paku pakis dan likofit. Sebilangan besar spesimen yang dikutip terdiri daripada famili Rubiaceae dan Zingiberaceae. Koleksi tumbuhan yang menarik termasuk empat spesies baharu daripada famili Gesneriaceae, Zingiberaceae dan Orchidaceae. Sejumlah spesies endemik di gunung Terengganu telah dikutip iaitu *Pentaphragma cyrtandriforme* (Pentaphragmataceae) dan *Microtropis tenuis* (Celastraceae) serta koleksi yang jarang ditemui seperti spesies palma iaitu *Licuala mustapana* (endemik di Pahang dan Terengganu), *Licuala fractiflexa* (tertumpu di Terengganu) and *Codonoboa*

are almost sessile and with only slightly revolute margins, and the tapered leaf bases.

### Botanical Expedition to Gunung Padang, Terengganu

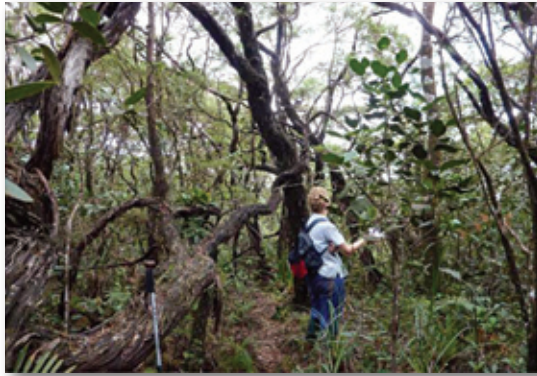


*Pentaphragma cyrtandriforme* (Pentaphragmataceae) —  
endemik di Terengganu  
*Pentaphragma cyrtandriforme* (Pentaphragmataceae) —  
endemic to Terengganu

The Terengganu hills are home to many interesting plant species, many of which are endemic to the area, but until today the hills have hardly been explored botanically. Gunung Padang (N4 50.929 E102 52.042 at 1315 m asl) is located on the Terengganu side of the National Park and was the focus of the botanical expedition organized by the Flora of Peninsular Malaysia Project from 16 to 26 March with FRIM's staff members, porters and guides. Prior to our expedition, Gunung Padang had been visited botanically only three times resulting in a total collection of about 200 herbarium specimens mostly of tree species. The focus of our expedition was to make a complete botanical survey, including climbers, epiphytes, herbs and ferns with the aim at making herbarium specimens of flowering and fruiting plants as the basis for a comprehensive checklist of plants of Gunung Padang.

To reach the summit we made five camps, Camp Sungai Chik, Camp Koh, Camp Spring, Camp Sandalwood and Camp Corybas. The last two were on ridges without a water source so our guides improvised and used *Johannesteijsmannia altifrons* leaves to collect rain water. The wind-swept summit was covered with medium-sized trees of same-size diameter, including species of *Illicium* and *Syzigium*. Just below the summit on more boggy soil, the twisted trunks of *Leptospermum flavescens*, *Dacrydium beccarii*, *D. medium* and *Vaccinium* sp. formed a more open canopy with the climbing pitcher

*grandifolia* (hanya ditemui di Gunung Padang dan Gunung Tahan).



Habitat bonsai  
Bonsai habitat

plant *Nepenthes sanguinea* and lush carpets of *Sphagnum* associated with the bladderwort *Utricularia minutissima*.

We collected a total of 525 of herbarium specimens representing approximately 446 species in 87 families, including 43 species of ferns and lycophytes. The most commonly collected families were Rubiaceae and Zingiberaceae. Interesting plants, included four new species belonging to the Gesneriaceae, Zingiberaceae and Orchidaceae. In addition, several species endemic to the Terengganu Hills, such as *Pentaphragma cyrtandriforme* (Pentaphragmataceae) and *Microtropis tenuis* (Celastraceae), were collected as were rare species like the palms *Licuala mustapana* (endemic in Pahang and Terengganu), *Licuala fractiflexa* (confined in Terengganu) and *Codonoboea grandifolia* (only known from Gunung Padang and Gunung Tahan).



*Leptospermum flavescens*—bunga/flower

## Buku Data Merah Tumbuhan Malaysia

Negara Malaysia yang mempunyai kepelbagaian biologi sedang menghadapi situasi yang agak mencabar dengan perubahan ekonomi yang makin pesat berkembang. Kebanyakan habitat kini telah terancam akibat daripada aktiviti-aktiviti pembangunan yang dilakukan oleh manusia dan menyebabkan bilangan spesies yang terancam kian meningkat saban hari. Terdapat banyak tumbuhan di Malaysia tersenarai di dalam Buku Data Merah IUCN. Namun demikian, Malaysia belum lagi mempunyai Buku Data Merah tumbuhan di peringkat kebangsaan. Sehubungan dengan itu, projek yang bertajuk “Pemuliharaan dan Pemantauan Tumbuhan Terancam dan Jarang ditemui Di Semenanjung Malaysia” yang dibiayai oleh Kerajaan Malaysia melalui Majlis Pembangunan dan Kemajuan Sains Negara (MPKSN) telah dijalankan. Objektif yang ingin dicapai adalah untuk menilai tahap ancaman spesies tumbuhan asli yang ada di Malaysia, menyediakan senarai data merah serta menjalankan aktiviti pemantauan pemuliharaan untuk tumbuhan terancam serta habitatnya melalui kaedah *in situ* dan *ex situ* bagi famili Dipterokarpa, Palma serta Begonia.

Famili pertama yang tersenarai di dalam senarai data merah kebangsaan ini ialah Dipterokarpa. Senarai merah ini meliputi semua taksa Dipterokarpa yang wujud di Semenanjung

## Malaysia Plant Red List

Being a mega-diverse country and a country with an economy in transition places Malaysia in a challenging situation. Habitats for many species are typically threatened through human activities and this gives rise to an increasing number of threatened plant species. Many Malaysian plants are listed in the global IUCN Red List. However Malaysia does not have its national Plant Red List. To address this, a project entitled “Conservation monitoring of rare and threatened plants of Peninsular Malaysia” was initiated by the Malaysian Government through the National Council for Scientific Research and Development (MPKSN). Objectives of this project are to produce an assessment of conservation status and threats for indigenous plants species in Malaysia, developing the Plant Red List for Malaysia and conducting conservation monitoring activities on threatened plants and their habitats through *in-situ* and *ex-situ* approaches for families Dipterocarpaceae, Palmae and Begoniaceae.

The family Dipterocarpaceae is the first family to be listed in the national Red List. The Red List covers dipterocarp taxa that are indigenous to Peninsular Malaysia including taxa that are common to the peninsula, Sabah and Sarawak. A total of 164 taxa comprising 155 species of Peninsular Malaysia Dipterocarpaceae were assessed. For Sabah and Sarawak, the

Malaysia termasuk taksa yang umum wujud di Semenanjung Malaysia, Sabah dan Sarawak. 164 taksa yang terdiri daripada 155 spesies yang ada di Semenanjung Malaysia telah dinilai. Untuk Sabah dan Sarawak, penilaian tidak dapat dilakukan sepenuhnya kerana daripada 267 spesies hanya 90 spesies sahaja yang umum kepada Semenanjung Malaysia. Sebanyak 92 taksa dipterokarpa yang wujud di Semenanjung Malaysia didapati berada dalam keadaan terancam dan 22 daripada spesies tersebut adalah endemik kepada Semenanjung Malaysia. *Shorea kuantanensis* merupakan satu-satunya takson yang didapati telah pupus (Extinct, EX) di Semenanjung Malaysia. Manakala, 15 taksa berada dalam kategori ancaman kritikal (Critically Endangered, CR), enam daripadanya iaitu *Hopea auriculata*, *H. bracteata* var. *penangiana*, *H. subalata*, *Shorea lumutensis*, *Vatica flavida* dan *V. yeechongii* adalah endemik kepada Semenanjung Malaysia. Selain itu, didapati bahawa 35 taksa berada dalam kategori terancam (Endangered, EN) dan 10 merupakan endemik kepada Semenanjung Malaysia.

Takson yang didapati telah pupus itu pernah wujud di negeri Pahang. Selain itu, Pahang mempunyai paling banyak bilangan taksa yang terancam iaitu 59 berbanding negeri lain di Semenanjung Malaysia. Bagi negeri Johor dan Perak pula, masing-masing mempunyai sebanyak 54 dan 53 taksa yang terancam. Kawasan di negeri Perak berkemungkinan paling terjejas akibat perubahan guna tanah kerana terdapat 10 taksa berkategori CR di negeri tersebut iaitu *Dipterocarpus coriaceus*, *D. semivestitus*, *H. auriculata*, *H. bilitonensis*, *Parashorea globosa*, *Shorea hemsleyana* ssp. *hemsleyana*, *S. lumutensis*, *S. teysmanniana* dan *Vatica flavida*. Terdapat beberapa spesies yang berada dalam kategori CR (*Dipterocarpus sarawakensis*, *D. semivestitus*, *Hopea auriculata*, *Vatica flavida*, *V. yeechongii*) dan juga EN (*Cotylelobium melanoxyylon*, *Dryobalanops beccarii*, *Dipterocarpus tempehes*, *Hopea coriacea*, *H. polyalthioides*, *S. inappendiculata*) telah diletak di bawah aktiviti pemantauan untuk pemuliharaan.

Beberapa populasi bagi spesies kategori CR dan EN yang berada di dalam kawasan hutan yang dilindungi sepenuhnya seperti Taman Negara, Taman Negeri, Hutan Simpan Dara dan juga Hutan Simpan Kekal. Untuk makluman, terdapat kawasan *in situ* bagi spesies *Cotylelobium melanoxyylon*, *Dryobalanops beccarii*, *Hopea subalata* dan *Vatica yeechongii* yang telah bertukar status kepada Hutan Bernilai Pemuliharaan Tinggi (High Conservation Value Forest, HCVF). Senarai data merah ini telah berjaya meningkatkan kesedaran pihak yang berkepentingan dengan langkah pemuliharaan telah diambil kira bersama-sama dengan pelan pembangunan di kawasan yang mempunyai spesies yang jarang ditemui dan terancam ini. Jalinan komunikasi dengan pihak swasta yang berkepentingan juga perlu dipertingkatkan lagi supaya secara tidak langsung dapat meningkatkan pengetahuan bagi melindungi spesies terancam ini. Setiap teknologi yang diguna pakai juga serta langkah pemuliharaan yang dijalankan seharusnya dikongsi bersama antara pihak yang berkepentingan ini. Selain itu, penglibatan organisasi bukan kerajaan dan masyarakat setempat serta program-program kesedaran yang dibentuk turut menyumbang ke arah usaha untuk menyelamatkan spesies terancam ini.

list is incomplete as these states have 267 species of which only 90 are common to the region of Peninsular Malaysia, Sabah and Sarawak. Ninety-two taxa of dipterocarps occurring in the peninsula have a threatened category nationwide; of these, 22 are endemic to the peninsula. The only taxon in this family thought to be extinct in the peninsula is *Shorea kuantanensis*. Of the fifteen taxa categorized under Critically Endangered (CR), six are endemic to Peninsular Malaysia. They are *Hopea auriculata*, *H. bracteata* var. *penangiana*, *H. subalata*, *Shorea lumutensis*, *Vatica flavida* and *V. yeechongii*. Of the 35 Endangered (EN) taxa, 10 are endemic to Peninsular Malaysia.

Pahang is the only state that has an extinct taxon. It also has 59 threatened taxa which is the highest when compared between states in the peninsula. This is followed by Johor and Perak with 54 and 53 taxa, respectively. Perak is perhaps the most vulnerable as it has the most number of CR (10 taxa). They are *Dipterocarpus coriaceus*, *D. semivestitus*, *H. auriculata*, *H. bilitonensis*, *Parashorea globosa*, *Shorea hemsleyana* ssp. *hemsleyana*, *S. lumutensis*, *S. teysmanniana* and *Vatica flavida*. The main threat to all threatened species is land-use change. Several species under category of CR (*Dipterocarpus sarawakensis*, *D. semivestitus*, *Hopea auriculata*, *Vatica flavida*, *V. yeechongii*) and EN (*Cotylelobium melanoxyylon*, *Dryobalanops beccarii*, *Dipterocarpus tempehes*, *Hopea coriacea*, *H. polyalthioides*, *S. inappendiculata*) are under long-term conservation monitoring.

Some of the CR and EN populations occur in protection forests such as national parks, state park, virgin jungle reserves and permanent forest reserves. In addition, the *in-situ* sites of *Cotylelobium melanoxyylon*, *Dryobalanops beccarii*, *Hopea subalata* and *Vatica yeechongii* are now recognized as High Conservation Value Forest (HCVF). The Red List has successfully increased the awareness of relevant stakeholders whereby a conservation measure has been integrated in their management plans in places where rare and threatened species occurs. Communications within private stakeholders should be enhanced as this could greatly increase each party's knowledge in protecting threatened species. Latest conservation measures and technologies should be shared among these parties. Besides, involvements of non-governmental organizations and local communities as well as various properly developed awareness programmes have also contributed towards saving these endangered species.



## Pemantauan Kupu-Kupu *Rajah Brooke's Birdwing*

Kupu-kupu *Rajah Brooke's Birdwing* (*Trogonoptera brookiana*) ialah kupu-kupu besar berwarna hitam dengan corak hijau berkilat. Kupu-kupu jantan yang dijumpai di bahagian barat ini berkumpul di kawasan lembab sepanjang tebing anak-anak sungai di banjaran gunung Semenanjung Malaysia. Tabiat *puddling* dan kecantikan kupu-kupu ini telah menjadikannya satu ikon ekopelancongan Malaysia. Walau bagaimanapun, sejak beberapa tahun ini, bilangan kupu-kupu ini semakin menurun akibat kehilangan habitat dan pengutipan yang terlampau.

Satu daripada kawasan yang masih mempunyai populasi kupu-kupu *Rajah Brooke's Birdwing* dalam jumlah yang besar ialah di perkampungan Ulu Geroh berhampiran pekan Gopeng. Penduduk tempatan dari puak Semai memanfaatkan kehadiran kupu-kupu ini menerusi aktiviti ekopelancongan. Antara usaha untuk membantu pemuliharaan spesies kupu-kupu ini, FRIM telah memulakan satu program pemantauan kupu-kupu ini di kawasan tersebut. Projek yang dibiayai oleh MFRDB turut melibatkan pembangunan kaedah pemantauan yang baharu dan kajian perlakuan terbang dan ritma *puddling*-nya.

Pada Disember 2009, satu projek pengalihan saluran paip di sepanjang tebing sungai Kampung Orang Asli Ulu Geroh didapati mengancam populasi kupu-kupu ini. Pengalihan paip yang dipasang semasa era penjajahan British telah menyebabkan kawasan hutan dilapangkan oleh jentera berat. Akibatnya, kawasan *puddling* kupu-kupu ini turut musnah oleh kerja-kerja penggalian dan kehadiran jentera berat. Pokok perumah bagi kupu-kupu ini mungkin turut musnah dalam proses yang sama. Projek pemantauan kupu-kupu *Rajah Brooke's Birdwing* yang dijalankan oleh FRIM telah berjaya mengetengahkan kepentingan usaha-usaha pemuliharaan kupu-kupu ini. FRIM telah memberikan pendapat profesional berhubung kesan-kesan buruk kepada habitat kupu-kupu ini apabila pengalihan saluran paip tidak dijalankan secara terancang. Paparan pihak media terhadap rintihan komuniti setempat dan situasi populasi kupu-kupu ini serta penglibatan agensi-agensi kerajaan telah membantu mengurangkan kemusnahan berlarutan. Selain itu langkah-langkah telah diambil untuk memulihara kawasan *puddling* juga. Hasilnya, kupu-kupu ini telah kembali semula ke kawasan ini. Jelas di sini penyelidikan adalah relevan dalam pemuliharaan spesies yang endemik dan bersifat ikonik.



*Rajah Brooke's Birdwing* berwarna hitam dengan loretan hijau berkilat

The black and iridescent green *Rajah Brooke's Birdwing*

## Monitoring of the *Rajah Brooke's Birdwing*

The *Rajah Brooke's Birdwing* (*Trogonoptera brookiana*) is a large, black and iridescent green butterfly. Males of the western race of this butterfly congregate at damp spots along the banks of a number of small rivers in the foothills of the central mountain range of Peninsular Malaysia. This habit, called 'puddling,' and the sheer beauty of the birdwing butterflies have made them an ecotourism icon in Malaysia. However, numbers of this birdwing have declined over the years due to loss of habitat and over-collecting.

One of the few remaining sites where the birdwings can be seen in large numbers is at the village of Ulu Geroh near Gopeng, where the local indigenous Semai community benefits from ecotourism to see this spectacle. To help in the conservation of this butterfly, FRIM has commenced a monitoring programme for the birdwings in this site. The project, which is currently funded by the MRFDB, also involves the development of a new technique for the purpose of monitoring the birdwings and studies of their behaviour and daily flight and puddling rhythms.

In December 2009, a pipeline removal project along the riverside at Kampung Orang Asli Ulu Geroh threatened the birdwing population. The forest was cleared with heavy machinery to facilitate removal of the pipes laid during the British colonial era, and the puddling sites of the butterfly were nearly destroyed by excavation work and trucks. Most plants of the birdwing were probably destroyed as a result of forest clearing. FRIM's *Rajah Brooke's Birdwing* monitoring project helped highlight the importance of conservation efforts for this butterfly. FRIM provided professional views on the potential effects of unmanaged removal of the pipeline on the habitat of the butterfly. With the help of the media, which highlighted the plight of the local community and the birdwing population, and the intervention of government agencies, subsequent damage was minimized and measures were taken to rehabilitate the puddling sites of the birdwing. As a result, the birdwings have now returned to the puddling site. This demonstrates the practical relevance of research to the conservation of endemic and iconic species.



Tabiat *puddling* dalam kumpulan yang besar kupu-kupu *Rajah Brooke's Birdwing* di tebing sungai di Kampung Orang Asli Ulu Geroh, Gopeng

*Rajah Brooke's Birdwings* puddling in large numbers beside the river bank at Kampung Orang Asli Ulu Geroh, Gopeng

## Projek Pemantauan dan Pengawasan Kualiti Air Sungai bagi Kawasan Hutan Simpan Kekal di Semenanjung Malaysia: Projek Kerjasama JPSM/FRIM

Bekalan sumber air merupakan satu keperluan asas dalam kehidupan masyarakat dan merupakan tanggungjawab kerajaan untuk memastikan rakyat mendapat bekalan air bersih secara berterusan dan diurus secara mampan. Di Malaysia, sungai-sungai dan lembangannya merupakan sumber bekalan air yang utama dan hampir keseluruhannya berpunca dari kawasan pergunungan atau tanah tinggi yang diliputi hutan semula jadi. Sebahagian besar kawasan tersebut telah diwartakan sebagai Hutan Simpan Kekal (HSK).

FRIM telah dilantik oleh JPSM sebagai agensi pelaksana projek penubuhan dan pengurusan kawasan tadahan air di dalam HSK iaitu projek di bawah program Pengurusan Hutan Simpan secara berkekalan. Melalui pelantikan tersebut, JPSM telah menyalurkan sebanyak RM600 ribu kepada FRIM bagi tujuan penubuhan tiga buah stesen pemantauan iaitu di negeri Kedah, Perak dan Johor.

Pembinaan stesen pemantauan kuantiti dan kualiti air di negeri Kedah, Perak dan Johor telah dimulakan sejak tahun 2009 dan diserahkan kepada pihak JPSM pada Jun. Selaras dengan kehendak projek kerjasama ini, satu latihan telah dilaksanakan pada 27–29 Julai bagi memberikan pendedahan umum kepada penjawat awam Jabatan mengenai cara-cara pengendalian peralatan dan pengutipan data kualiti air dari stesen-stesen tersebut. Secara keseluruhannya, ketiga-tiga stesen yang dipasang di Sg Muda, Kedah, Sg Salor, Perak dan Sg Lenggong, Johor berfungsi dengan baik. Satu laporan teknikal telah dihantar kepada JPSM yang merangkumi aspek prosedur pengutipan dan analisis data.

## Monitoring and Controlling Water Quality for Permanent Reserved Forest (PRF) in Peninsular Malaysia: A FDP/FRIM Collaboration

Water is a basic necessity of communities and it has been the responsibility of the government to ensure continuous sufficient clean water supply and manage it on a sustainable manner. In Malaysia, rivers and basins are the major sources of water where almost all originate from mountainous regions or highlands covered mostly with natural forest. Most of these areas have been gazetted as permanent reserved forests (PRFs).

FRIM has been appointed by the FDP as the agency to implement the water catchment establishment and management within the PRF under the sustainable forest management programme. Through the appointment, an amount of RM600 000 has been channelled to FRIM to establish three monitoring stations in the states of Kedah, Perak and Johore.

The project began in 2009 and was successfully handed over to FDP in June. In line with the project requirement, FRIM conducted a training session for FDP staff on 27–29 July. The training provided basic knowledge to the staff on equipment handling and data collection from the monitoring stations. Overall, all monitoring stations were functioning accordingly. A technical report has been submitted to FDP which included the data collection procedures and data analysis.



Para peserta didedahkan dengan kaedah kalibrasi peralatan pengesan kualiti air pelbagai parameter dan pengesan perakam paras air

Participants exposed to the calibration method for the multi-parameter water-quality and water level sensor during the training

## **Kajian Masalah Sosio-Ekonomi dan Langkah Penyelesaian yang Berkaitan dengan Penanaman Bakau dan Ru di Semenanjung Malaysia**

Pada tahun 2009–2010, FRIM telah dipertanggungjawab oleh kerajaan untuk mengkaji masalah sosio-ekonomi yang berkaitan dengan penanaman bakau dan ru di Semenanjung Malaysia ekoran daripada tragedi tsunami pada tahun 2004 dan kerajaan telah mengambil langkah menanam bakau dan ru di kawasan pesisiran pantai terpilih di seluruh negara. Langkah ini diambil memandangkan hutan bakau dan ru berperanan penting sebagai pelindung kepada kawasan pesisiran pantai. Antara tahun 2005 hingga 2009, seluas 1828 ha kawasan pesisiran pantai telah ditanam dengan spesies-spesies pokok yang bersesuaian di seluruh negara.

Kajian ini mendapati penanaman pokok bakau/ru di kawasan pesisiran pantai tertentu di negeri Perlis, Perak, Selangor, Pahang dan Terengganu telah membawa kepada masalah sosio-ekonomi seperti vandalisma, gangguan ternakan, kerosakan pokok dan pencerobohan. Masalah ini ada hubung kaitnya dengan kekurangan konsultasi kepada masyarakat tempatan sebelum penanaman bakau/ru sehingga menyebabkan penduduk tempatan kurang sedar tentang peranan mereka dalam usaha pemuliharaan bakau/ru.

Oleh yang demikian, adalah penting bagi pihak pengurusan hutan menukar paradigma dengan mengamalkan polisi yang menggalakkan penyertaan penduduk tempatan dalam pengurusan hutan. Cadangan untuk menyelesaikan masalah sosio-ekonomi termasuklah melalui konsultasi berterusan dengan penduduk tempatan, pemantauan berjadual, kempen kesedaran di kalangan pelawat dan pemasangan papan tanda di kawasan strategik.

Sehubungan dengan itu, kegiatan penanaman bakau/ru pada masa hadapan haruslah memberi fokus terhadap kesedaran penduduk tempatan dan pelawat pantai di samping meningkatkan penglibatan mereka sama ada secara langsung atau tidak langsung. Oleh itu, dua prosedur untuk meningkatkan lagi kesedaran penduduk tempatan serta pelawat terhadap pemeliharaan kawasan penanaman bakau/ru telah dicadangkan kepada Jabatan Perhutanan Semenanjung Malaysia untuk memastikan kejayaan penanaman semula.

### **R&D Hiliran**

Hutan senantiasa membekalkan sumber untuk aktiviti industri di negara ini. Untuk memastikan penggunaan yang cekap dan lestari, FRIM terlibat dalam penyelidikan dan pembangunan dalam pelbagai-bidang industri hiliran untuk meningkatkan nilai bekalan. Kerja-kerja mengoptimumkan kadar perolehan pengergajian balak telah dilaksanakan. Untuk meningkatkan nilai serta memastikan bekalan kayu berkekalan, penggunaan kayu jaras bakau untuk perabot dan pergola telah dicuba. Sifat-sifat kayu klon sesenduk untuk pembangunan ladang hutan juga dinilai. Selain itu, produk baharu yang mesra alam telah dibangunkan seperti produk kayu terjurutera, MYScrim. Dalam bidang produk semula jadi, usaha untuk menggunakan profil tapak jari untuk jaminan kualiti dan komersialisasi produk herba dipertingkatkan. Kerja-kerja penyaringan sebatian yang berpotensi untuk rawatan penyakit dijalankan.

## **A Study of the Socio-Economic Problems and Solutions Related to Mangrove and Rhu Replanting in Peninsular Malaysia**

In 2009–2010, FRIM was entrusted with the responsibility by the Malaysian Government to conduct a study of the socio-economic problems related to mangrove and rhu replanting in Peninsular Malaysia. Following the tsunami tragedy in 2004, between 2005 and 2009, a total area of 1828 ha of coastal area were planted with mangrove and rhu in Malaysia.

The study found that coastal replanting of mangrove and rhu in Perlis, Perak, Selangor, Pahang and Terengganu had met with socio-economic problems such as vandalism, damage by farm animals, damage to trees and encroachment into the replanting areas. These problems were closely related to the lack or absence of consultation with the local communities living near the replanting areas prior to the replanting. The local villagers were not sure of their role in ensuring successful coastal replanting.

Hence, it is important for forest managers to change their paradigm by encouraging local participation in forest management. Suggestions to resolve existing problems include direct consultations with the locals, monitoring, having awareness campaigns and putting up sign boards at strategic location.

For future mangrove and rhu replanting, the focus should be directed at local residents and visitors to the beach. Two procedures to raise the awareness of locals and enlist their involvement in forest management were suggested to the Forestry Department Peninsular Malaysia to ensure the replanting activities achieve the target in the long run.

### **Downstream R&D**

The forest has always been providing a wealth of resources for industrial activities in this country. To ensure efficient and sustainable utilization, FRIM is engaging in multi-disciplinary downstream R&D activities in the hope of adding more value to the resources. Work on optimization of sawing recovery of logs was conducted. To add more value and ensure continual timber supply, the processing of bakau poles for non-traditional uses such as furniture and pergola was explored. The properties of sesendok clones for future forest plantation development were also evaluated. Other than those, new environmentally friendly products have been developed such as biodegradable products and the engineered lumber, MYScrim. In the natural products area, efforts to apply chemical fingerprint profiles for quality assurance and development of herbal products have been intensified. Work on screening of potential compounds for treatment of diseases is ongoing. Biotechnology tools are being continuously developed and applied to enhance forest plantation development and resource management.

Perkakasan bioteknologi dibangunkan secara berterusan dan digunakan untuk meningkatkan pembangunan ladang hutan dan pengurusan sumber.

### Produk Mesra Alam ke Arah Menghijaukan Alam Sekitar Kita

Pelbagai usaha terus dipergiatkan di FRIM ke arah menghasilkan rangkaian produk mesra alam yang memenuhi permintaan pasaran masa kini yang semakin cenderung menjaga kelestarian alam sekitar. Salah satu strategi jangka panjang FRIM ialah menjalin hubungan strategik dengan sektor swasta. Dimulakan pada Oktober 2009, kerjasama R&D antara FRIM dan SPPT Engineering Sdn Bhd telah membuahkan hasil dengan munculnya bekas makanan mesra alam yang menyediakan alternatif kepada pasaran pembungkus makanan yang dikuasai polisterina. Diperbuat daripada 100% gentian palma, bekas makanan mesra alam ini sesuai untuk pelbagai keadaan makanan yang berminyak, kering dan cair, sama ada sejuk ataupun panas. Selain itu, prototaip beg kertas dan sampul surat juga telah dibangunkan; kedua-duanya diperbuat daripada kertas yang menggunakan 100% gentian palma.

Bulan Januari tahun 2011 akan menjadi detik penting dan bersejarah apabila FRIM bakal mempelopori penggunaan bekas makanan, beg kertas dan sampul surat yang mesra alam dan boleh mengurai sendiri. Penggunaan produk mesra alam ini menyerlahkan usaha FRIM ke arah memulihara alam sekitar yang tidak ternilai. Pendekatan 'serampang dua mata' ini mengesahkan usaha berterusan FRIM dalam memulihara sumber hutan Malaysia tatkala wujudnya bekalan bahan bio-alternatif yang boleh diusahakan untuk membangunkan pelbagai produk hiliran.

### Biodegradable Products towards Greening Our Environment

Efforts have been intensified by FRIM to develop green products from lignocellulosic fibres to meet the more environmentally-driven market demands nowadays. One of the FRIM's strategies for the way forward is engaging a strategic partner from the private sector. Since its inception in October 2009, a collaborative R&D between FRIM and SPPT Engineering Sdn Bhd has borne fruit upon the emergence of a biodegradable food container that offers the market with an alternative to using polystyrene for food-packaging. The biodegradable container, made from 100% palm fibres, is suitable for oily, dry and juicy or gravy foods; cold or hot. In addition to that, prototypes of paper bags and envelopes have also been developed; both produced from commercially manufactured paper using 100% palm fibres.

The month of January 2011 will be marked as a significant milestone for FRIM as the institute begins to use biodegradable products in its food containers, paper bags and envelopes. The use of these biodegradable products emphasises FRIM's effort towards greening our precious environment. In addition, such an attempt endorses FRIM's continual effort to conserve Malaysian forest resources whereby alternative biomaterials are made available to be tapped and used to develop many downstream products.



Bekas makanan mesra alam  
Biodegradable food container



Gulungan kertas sedia untuk dieksport  
Paper rolls ready to be exported



Pototaip sampul surat daripada gentian palma  
Prototype envelope from palm fibres



Beg kertas prototaip daripada gentian palma  
Prototype paper bags from palm fibres

## Pergola daripada bakau

Bakau merupakan satu spesies yang sinonim sebagai tanaman pantai dan meliputi sebahagian besar pantai barat dan pantai timur Semenanjung Malaysia. Bakau mudah dikenali dengan topang (prop) yang melengkung dan akar jangkang dan tumbuh dengan baik di kawasan berair, berlumpur dan mendap serta sinonim dengan kawasan pesisiran pantai. *Rhizophora* spp. (bakau) diklasifikasikan sebagai kayu keras berat dalam kumpulan chengal, balau, merbau dan resak. Dengan ketumpatan sekitar  $1040 \text{ kg m}^{-3}$  dan kekuatan dalam kelas A serta mempunyai ketahanan terhadap kelembapan, kayu bakau sering dianggap berat dan sukar untuk dikerjakan. Bakau juga mempunyai nilai komersial yang rendah kerana sifatnya yang mudah merekah dan meleding bila dikeringkan. Bakau juga mempunyai rentangan yang baik terhadap pereputan tetapi tidak kepada kumbang air walaupun sering digunakan sebagai cerucuk. Bakau mempunyai hubungan yang lama sebagai bahan tradisional di kampung, namun kegunaannya masih terhad kepada tiang-tiang rumah dan kayu arang. Walau bagaimanapun, dengan pelbagai isu yang timbul tentang penebangan pokok hutan tropika, umum dan industri sering mencari alternatif kepada kayu. Selain harga bahan mentah yang meningkat, usaha kita sedang dijalankan untuk menjadikan bakau sebagai bahan mentah yang mempunyai nilai tambah untuk dijadikan pergola dan perabot taman. Kajian ini bertujuan untuk mengatasi kekangan tersebut dan mengeksploitasi kelebihan dan sifat semula jadi bakau agar boleh diterima oleh pihak industri dan orang ramai.

Dalam mereka bentuk pergola, kriteria pemilihan sering tertumpu pada nilai estetika dan ketahanan bahan mentah. Oleh itu, sering kali spesies popular seperti chengal dan balau menjadi pilihan. Bakau kini menawarkan pilihan yang menarik kepada spesies yang dinyatakan tadi berdasarkan kebolehdapatan, harga dan nilai estetika. Spesies yang dipilih ialah bakau minyak dan bakau kurap dengan ketumpatan kayu antara  $700\text{--}900 \text{ kg m}^{-3}$ . Dua saiz ukur lilit telah dipilih; melebihi 150 mm dan kurang daripada 125 mm. Bakau yang mempunyai kadar kelembapan asal sekitar 50% harus dikeringkan sehingga 12–16 peratus kandungan kelembapan. Retakan permukaan dan hujung ialah sifat inheren yang sering kelihatan semasa proses pengeringan. Langkah-langkah harus diambil untuk mengatasi masalah ini dan menghalang air daripada menyerap masuk ke dalam rekahan ini bagi menghalang pereputan dan kulat. Ini boleh diatasi dengan menggunakan resin khas untuk menutup rekahan tersebut manakala racun perosak pula dicampur ke dalam bahan kemasan.



Pergola daripada bakau  
Pergola from bakau

## Pergola from Bakau

Bakau is a common mangrove tree that is found mainly in coastal areas of Peninsular Malaysia. It can be immediately recognized by its arching prop and stilt roots. It also grows best in wet, muddy and silty sediments and is synonymous with coastal areas. The *Rhizophora* spp. (bakau) are classified under heavy hardwoods, the same group as chengal, balau, merbau and resak. Having an average density of  $1040 \text{ kg m}^{-3}$  in strength group A with resistance to moisture, it is considered dense and difficult to work with. Bakau has low commercial value as timber because of its tendency to split and warp when dried. It is resistant to decay but not to marine borers although bakau is often used as piles. Despite its long association with and traditional usage by villagers, bakau is limited in usage to columns/stilts and charcoal. However, with various issues arising from forest felling, people are looking for alternatives to timber. And with the increase in the prices of raw materials, efforts are already being directed to add value to bakau in other commercial and value-added products such as pergolas and garden furniture. This study aims at addressing the limitation and exploiting the advantages and natural beauty of bakau to be accepted commercially.

In making pergola, the main criteria of selection are the aesthetic value and durability of the timber material. As such, it is common that buyers prefer the more popular species such as chengal and balau. Bakau offers an interesting alternative to the species mentioned with respect to its availability, price and aesthetic value. The species selected are bakau minyak and bakau kurap having density ranging from  $700$  to  $900 \text{ kg m}^{-3}$ . Two diameter sizes were used in this project; over 150 mm and less than 125 mm. The bakau with an initial moisture content of about 50% was first skinned and dried via a forced air-drier to about 12–16 percent for external use. Surface and end-cracks are quite inherent during the drying process. Steps are taken to arrest this problem and prevent moisture from accessing into the cracks that could result in the growth of unwanted moulds and decay. Preventive actions taken are filling the cracks with special resin and having insecticides mixed into the finishing stain.



Pandangan orang ramai serta penerimaan terhadap penggunaan bakau masih rendah. Kebimbangan terhadap rekahan permukaan merupakan faktor utama. Sehingga satu kajian menyeluruh terhadap keupayaan bakau diperoleh, pandangan dan tanggapan negatif orang ramai akan mengambil masa untuk berubah. Dengan mengambil pendekatan reka bentuk yang berbeza serta memasukkan elemen rekahan permukaan bakau ini sebagai sebahagian daripada ciri reka bentuk, ia mungkin dapat menarik minat orang ramai. Dengan terlaksananya projek ini, diharap usaha untuk menaikkan nilai komersial kayu bakau akan berjaya.

### Klon Sesenduk—Kayu-Kayan yang Berpotensi

Kayu getah telah digunakan secara meluas di Malaysia dalam pembuatan perabot kayu, papan serpai dan papan gentian berketumpatan sederhana (MDF). Permintaan kayu getah yang tinggi menyebabkan harga kayu getah juga semakin meningkat. Peningkatan harga ini telah menyebabkan kesukaran pihak pengusaha untuk bersaing dalam pasaran antarabangsa. Oleh yang demikian, penyelidik FRIM telah berusaha mencari alternatif kayu lain yang hampir atau lebih baik dari segi kualiti dan rupa permukaan. Sesenduk atau nama saintifiknya *Endospermum diadenum* telah dikenal pasti sesuai bagi menggantikan atau menampung permintaan bagi kayu getah. Kayu sesenduk ini telah lama digunakan sebagai papan lukis, dulang, papan lapis, permainan kayu dan kayu penyepit pakai buang. Benih sesenduk yang digunakan bagi klon ini diambil dari Hutan Simpan Bentong, Pahang. Benih daripada pokok terpilih tersebut telah diambil dan ditanam di tapak semeian di FRIM dan tunas pokok telah berjaya dicambahkan dengan kaedah kultur tisu dan kemudian ditanam di pelbagai jenis tanah di FRIM. Pertumbuhan klon FRIMsrp001 ini sangat cepat dan selepas 10 tahun ditanam di tanah yang sesuai, pokok ini telah mencapai 30 cm diameter paras dada dan mencapai ketinggian 24 m. Penyelidikan telah dijalankan bagi mencari ciri-ciri kekuatan asas dan juga telah dibuat produk perabot daripada kayu padu dan venir (moulded furniture). Hasil daripada penyelidikan tersebut, didapati ciri-ciri kekuatan kayu sesenduk ini hampir sama dengan ciri-ciri kekuatan kayu matang yang ditebang dari hutan asli. Produk perabot yang dihasilkan juga telah melepasi tahap yang ditetapkan oleh BS EN1728, 6.2.1 (seat and back static load) dan BS EN 1728, 6.7 (seat and back fatigue). Buat masa ini, FRIM sedang dalam proses mempromosikan klon sesenduk ini untuk ditanam secara besar-besaran sebagai hutan ladang untuk dijadikan bahan tambahan bagi industri perabot negara.

Public perceptions and acceptance towards the utilization of bakau are still low. Surface cracks and splits are their primary concern. Until a complete compilation on the in-service performance of bakau is obtained, perceptions and reservations of the general public would take time to change. More adventurous designs must be explored by taking into account the inherent cracks in bakau as part of the design concept. As such, with this project, it is hoped that the future of bakau as timber with high commercial value would improve.

### Sesenduk Clone—A Future Timber

Rubberwood is used exclusively for the production of solid furniture, particleboard and medium density fibreboard (MDF) in Malaysia. Due to the increasing demand for rubberwood, the price is also increasing. This has caused some difficulties to the manufacturers to stay competitive in the international market place. FRIM has decided to look for an alternative to rubberwood which is similar or even better in terms of quality and appearance. Sesenduk (*Endospermum diadenum*) was found to be suitable for all the uses of rubberwood. Traditionally, it has been used for various applications such as drawing boards, trays, plywood, toys and disposable chopsticks. Seeds of a sesenduk tree from Ulu Trantum Forest Reserve in Bentong, Pahang, were collected for cloning. The seeds of the tree were raised in FRIM's nursery and buds from the plant were successfully tissue-cultured and then planted in various soil conditions. The growth of clone FRIMsrp 001 was relatively fast. After 10 years of planting on suitable soil, the trees are able to achieve 30 cm in diameter and 24 m in height. A study was undertaken to assess the basic properties as well as the product development of the clone in both solid and veneer forms. The timber properties were found to be fairly similar to those of the timber from matured trees harvested from the natural forest. Product development from solid wood and veneer was successfully accomplished and met the requirements set by BS EN 1728, 6.2.1 (seat and back static load) and BS EN 1728, 6.7 (seat and back fatigue) standards. FRIM is proposing mass planting in plantation forest of the sesenduk clone as a source of raw material for the timber products manufacturers.



Klon sesenduk berusia 12 tahun  
12 years old sesenduk clone

## Optimisasi Proses Pemotongan Balak untuk Pulangan Nilai Maksimum

Memandangkan harga balak yang semakin meningkat dan kualitasnya yang semakin menurun, pengusaha kilang papan dan industri hiliran perlu membuat sesuatu untuk memastikan produk yang dihasilkan kekal kompetitif. Berbagai-bagai usaha sedang dijalankan bagi mengurangkan kos pengeluarannya termasuk harga kayu gergaji agar industri yang berkaitan kekal berdaya saing.

Dewasa ini, pemotongan balak bergantung terutamanya pada pengalaman di samping tindakan intuitif krew pemotong balak yang terlibat. Memandangkan terdapatnya pelbagai saiz kayu gergaji yang perlu dipotong dan harga masing-masing yang berbeza, di samping bentuk balak yang berlainan, tugas mereka semakin sukar malah mencabar.

Suatu perisian pengoptimuman pemotongan balak jenis 2-dimensi yang berpatutan harganya telah dibangunkan terutamanya untuk balak dari hutan tropika yang pada umumnya mempunyai saiz yang tidak seragam. Ia menawarkan penyelesaian yang dapat menghasilkan peluang nilai atau isi padu yang terbaik akan dijana. Percubaan awal menunjukkan sistem ini dapat meningkatkan keuntungan pengusaha kilang papan secara signifikan dan dijangka akan mendapat lebih manfaatnya apabila harga balak meningkat lagi pada masa akan datang.



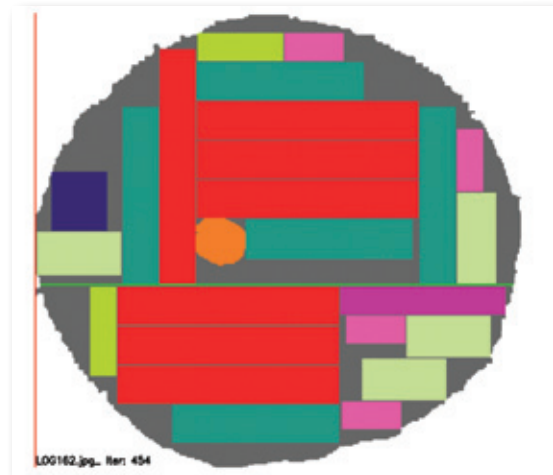
Salah satu balak yang digunakan dalam kajian  
One of the logs used in the cutting study

## Optimizing Sawing Throughput of Logs for Maximum Value Recovery

In view of the escalating prices and depleting quality of logs particularly from natural forests, both sawmillers and subsequently down-stream operators find it a daunting task to keep timber products as competitive as before. Means are always being sought to minimize the cost of production including that of the sawn timber such that the industry will remain viable.

Currently, cutting of logs depends mainly on the experience as well as intuitive response of the sawing crew involved. Their task is, however, getting tougher and more complex in view of the multiple dimensions of sawn timber to be cut and the different prices associated with it, besides the variable shapes of logs obtained.

An affordable 2D log-cutting optimization software was developed particularly for logs from tropical forest which are generally non-regular in shape. It provides cutting solution that produces maximum value or volume recovery. The system asks for image of suitable end section of a log to be inputted as well as required cutting sizes and corresponding selling price. A desired number of cutting solutions with the best value or volume of recovery will be generated. Initial trials show that this system is able to improve the profitability of sawmillers significantly and its benefit is expected to be even more when log prices escalate even further in years to come.



Output janaan sistem yang dihasilkan  
Typical output in optimized cutting

## MyScrim, Projek Berstatus Flagship

Projek berstatus *flagship* ini diwujudkan pada awal tahun 2010 bagi menerokai kemungkinan membangunkan kayu terolah daripada pelbagai spesies pokok tempatan menggunakan teknologi proses terkini yang dinamakan *Steam Pressed Scrim Lumber* (SPSL) milik syarikat Timtek LLC, USA. SPSL merupakan hasil pemajuan ke atas teknologi *Scrimber* yang direka cipta oleh saintis CSIRO di Australia pada pertengahan tahun 70-an tetapi gagal dikomersialkan sepenuhnya. Dalam teknologi *Scrimber* ini, kayu balak yang telah dibuang kulit dilalukan menerusi beberapa pasangan dram bergigi dan terlenyek sehingga menjadi seakan-akan kepingan tikar yang mempunyai tetali-tetali kayu yang masih bertaut antara satu sama lain. Kepingan-kepingan tikar tetali kayu ini kemudiannya dikeringkan sebelum dilitupi dengan perekat dan ditekan menjadi beluti-beluti kayu terolah. Syarikat Timtek yang mendapatkan hak penuh ke atas idea asal *Scrimber* tersebut telah memajukannya dengan kerjasama *Mississippi State University* sehingga berjaya menghasilkan kayu terolah daripada bahan penjarakan ladang *Southern Yellow Pine* yang menepati spesifikasi industri pembinaan di Amerika Syarikat.

Kerjasama antara saintis FRIM dan Timtek bermula dalam bulan Julai tahun 2008 apabila Dr Wan Tarmeze Wan Ariffin dan Dato' Dr Marzalina Mansor yang mereka cipta POPS Lumber™, kayu terolah daripada bahan batang kelapa sawit yang memenangi anugerah *WIPO Best Inventor 2008* menghubungi pemilik Timtek iaitu En Walter Jarck untuk mendapatkan kerjasama beliau bagi menghasilkan POPS Lumber™ menggunakan teknologi SPSL. Setelah persetujuan dicapai, pada bulan Januari 2009 beberapa kotak venir batang kelapa sawit terlerai telah diposkan ke Timtek *Pilot Plant* yang terletak di dalam kampus *Mississippi State University* dan dijadikan lapan beluti kayu terolah yang kini dinamakan MYScrim-OPT (*Patent Pending* PI 20084309). Sejurus menerima beluti-beluti MYScrim-OPT dari Timtek, kumpulan pereka cipta FRIM itu telah menguji kesesuaian kayu tersebut sebagai bahan pembuatan pelbagai produk dalam seperti perabot, pepapan lantai, pintu dan kayu kumai.

Kejayaan menghasilkan MYScrim-OPT telah dilihat oleh kedua-dua pereka cipta FRIM tersebut sebagai satu peluang besar untuk mereka meneruskan kerjasama dengan Timtek bagi mengkomersialkan MYScrim-OPT dan juga untuk membangunkan kayu terolah daripada lain-lain spesies tempatan, justeru telah memohon kepada pengurusan FRIM agar projek ini diberikan status *flagship*. Sepanjang tahun 2010 telah digunakan untuk mempromosi kepada umum produk-produk yang dihasilkan daripada MYScrim-OPT melalui pameran-pameran dan seminar-seminar yang disertai seperti MIFF 2010, ITEX 2010, MTC Global WoodMart 2010 BioMalaysia 2010, ISFFP 2010 dan *MTC Timber Talk Series*. MYScrim-OPT dan produk-produknya ternyata amat diterima umum dan ini dibuktikan dengan dua anugerah pingat emas yang dimenangi (Pingat Emas ITEX dan Pingat Emas BioInnovation).

Selain MYScrim-OPT, dua lagi kayu terolah telah dihasilkan menggunakan teknologi proses SPSL iaitu MYScrim-coconut daripada venir terlerai batang kelapa dan MYScrim-bambuseae (UI 20090513) daripada lidi higo buluh terlerai.

## MYSkrim, the Flagship Project

This flagship project was established in the beginning of 2010 with the main objective to investigate the possibility of developing engineered lumbers from various local tree species using the latest process technology called Steam Pressed Scrim Lumber (SPSL) patented by Timtek LLC, USA. SPSL is the refined version of Scrimber, an engineered lumber technology developed by scientists at CSIRO Australia in the mid-70s that failed to commercialize. In the Scrimber technology, a log is debarked before being flattened and crushed by a series of grooved rolling mills to form a mat of interconnected fibrous strands. The individual mats of flattened scrim are passed through a continuous dryer and then coated with adhesive before heat pressed into engineered lumber beams. Timtek LLC acquired the rights to the Scrimber original ideas and worked to further develop the process. Through a collaboration with the Mississippi State University, Timtek has successfully manufactured the engineered lumber that meets the US building industry specifications using Southern Yellow Pine plantation thinning materials.

FRIM and Timtek collaboration began in July 2008 when Dr Wan Tarmeze Wan Ariffin and Dato' Dr Marzalina Mansor who had co-invented POPS Lumber™, an award winning (WIPO Best Inventor 2008) engineered lumber made from oil palm trunk material, contacted the Timtek owner, Mr Walter Jarck, and asked him to make POPS Lumber™ beams using SPSL process technology. After agreement was reached, in January 2009 boxes of scrimmed oil palm trunk veneers were sent to Timtek Pilot Plant located in the campus of Mississippi State University and pressed into eight engineered lumber beams that are now code-named MYScrim-OPT (Patent Pending PI 20084309). Upon receiving the MYScrim-OPT beams from Timtek, the FRIM inventors have evaluated the suitability of the lumber as raw material for manufacturing various wood products such as furniture, floorboards, doors and mouldings.

The successful MYScrim-OPT development endeavour was regarded by the inventors as a huge opportunity for them to further collaborate with Timtek to commercialize MYScrim-OPT and to develop more engineered lumbers from other local species; therefore they have asked FRIM management to give the project a flagship status. The year 2010 was filled with the activities to introduce and promote MYScrim-OPT and its products to the public through exhibitions and seminars such as MIFF 2010, ITEX 2010, MTC Global WoodMart 2010 BioMalaysia 2010, ISFFP 2010 and MTC Timber Talk Series. MYScrim-OPT and the products were well accepted by the public and this has been manifested in the winning of two gold medals (ITEX Gold and BioInnovation Gold).

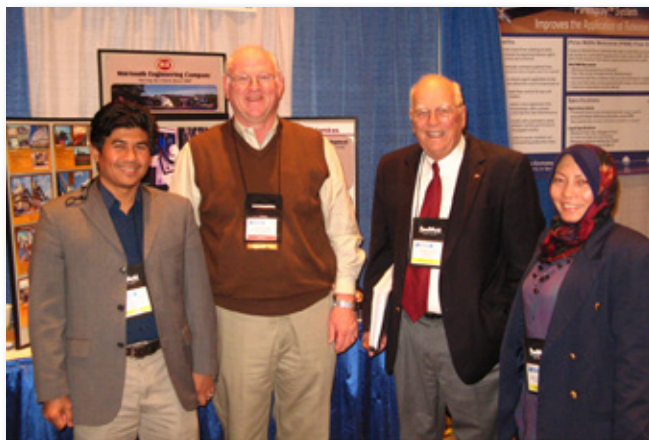
Besides MYScrim-OPT, two more engineered lumbers were developed using the SPSL technology, i.e. MYScrim-coconut from scrimmed coconut veneers and MYScrim-bambuseae (UI 20090513) from crushed bamboo higo sticks.



Dato' Dr Marzalina dan Dr Wan Tarmeze menjelaskan kepada Tun Dr Mahathir tentang kaedah kemasiapan MYScrim-OPT  
Dato' Dr Marzalina and Dr Wan Tarmeze explaining MYScrim-OPT to Tun Dr Mahathir



MYScrim-OPT dipamerkan di MTC Global Woodmart 2010  
MYScrim-OPT exhibited at the MTC Global Woodmart 2010



Aktiviti mempromosi MYScrim di PELICE 2010, Atlanta, AS  
MYScrim-OPT promotional activity at PELICE 2010, Atlanta, USA

## Pembangunan Profil Cap Jari Kimia untuk Tumbuhan Ubatan dan Beraroma Terpilih

Ubatan herba dan produk berasaskan herba telah digunakan secara meluas sebagai produk terapeutik di kebanyakan negara. Kebanyakannya disediakan daripada ekstrak mentah tumbuhan yang mengandungi campuran pelbagai sebatian fitokimia yang kompleks. Produk herba ini berkemungkinan mengandungi beratus-ratus komponen yang aktif. Ciri-ciri sebatian kimia ini adalah berbeza antara spesies. Namun, kandungan ekstrak herba yang sama juga boleh berbeza-beza bergantung pada musim penuaian, lokasi asal tumbuhan, proses pengeringan dan faktor-faktor yang lain. Oleh itu, kawalan kualiti sentiasa menjadi isu utama dalam proses pembangunan ubatan herba dan produk berasaskan herba. Jelas diketahui bahawa kualiti bahan mentah yang digunakan dalam penghasilan sesuatu produk akan mempengaruhi kualiti produk akhir yang dihasilkan. Maka, keaslian dan kualiti bahan mentah adalah penting dalam menjamin keselamatan dan keberkesanan produk tersebut kepada pengguna. Kaedah amalan pengenalan spesies secara botani menjadi mustahil untuk dilaksanakan kerana pengilang herba selalunya membeli bahan mentah yang telah dipraproses dan oleh itu, teknik cap jari kimia menjadi satu kemestian dalam pemantauan kualiti bahan mentah.

Dalam kajian ini, profil cap jari melalui *Fourier-transform infrared* (FTIR) pelbagai-langkah dan kromatografi cecair-spektrometri jisim (LC-MS) bagi tiga varieti *Labisia pumila* (*L. pumila* var. *alata*, *L. pumila* var. *pumila* dan *L. pumila* var. *lanceolata*) telah dibangunkan untuk membezakan ketiga-tiga varieti tersebut. *Labisia pumila* atau lebih dikenali tempatan sebagai kacip fatimah berserta ketiga-tiga varietinya telah bertahun-tahun digunakan di kalangan wanita Melayu di Malaysia untuk mempercepat dan memudahkan proses kelahiran. Selain itu, ia turut digunakan untuk merawat 'menorrhagia' (menstruasi yang terlampau atau berlanjutan) dan sebagai tonik selepas bersalin. Herba ini tergolong dalam genus kecil yang sedikit berkayu daripada famili Myrsinaceae dan ia boleh dijumpai di negara Thai dan Indo-china melalui Semenanjung Malaysia hingga ke Sumatera, Borneo, Jawa, Filipina dan Papua New Guinea. Ia tumbuh secara liar di tanah rendah atau tanah tinggi hutan hujan Malaysia dalam pelbagai jenis tanah (i.e. tanah berhumus tinggi, tanah lom berpasir, tanah liat yang dalam dan tanah granit yang berasid) pada altitud ketinggian kira-kira 20 hingga 1500 m. Ketiga-tiga varieti tersebut boleh dibezakan berdasarkan ciri-ciri petiol (tangkai daun); iaitu bersayap lebar, bersayap runcing dan hampir silinder (tanpa sayap). Pembezaan ketiga-tiga varieti ini agak sukar terutamanya di kalangan orang biasa kerana tidak mahir dalam mengenal pasti bahagian daun yang perlu diperiksa untuk mengesahkan varieti tersebut. Setiap varieti mempunyai penggunaan yang berbeza, justeru, adalah penting untuk memastikan penggunaan varieti yang betul bagi setiap kes yang digunakan. Maka, kaedah pencirian kimia yang berkesan untuk setiap varieti perlulah dibangunkan.

Kajian spektroskopi 1D-FTIR menunjukkan bahawa keseluruhan spektra untuk ketiga-tiga varieti *L. pumila* secara umumnya adalah sama berdasarkan kepada posisi puncak. Lebih banyak perbezaan dapat diperhatikan pada spektra terbitan kedua (*second derivative*) yang memberikan maklumat

## Development of Chemical Fingerprint Profiles of Selected Medicinal and Aromatic Plant

Herbal medicines and their derived products are widely used as therapeutic products in many countries. Most of them are often prepared from the crude plant extracts, which comprise a complex mixture of different phytochemical constituents. There may be hundreds of active components in these herbal preparations. The chemical features of these constituents differ considerably among the different species. Even the same herbal extracts may vary depending upon the harvesting season, plant origin, drying process and other factors. Therefore, quality control has always been the key issue in the development of herbal medicines and their derived products. It is well known that the quality of raw material used in the manufacture of a product is reflected in the quality of the finished product. Therefore, the authenticity and quality of the raw material is of prime importance in ensuring safety and efficacy of its products to consumers. The routine botanical species identification represents an unfeasible approach because herbal manufacturers often buy the pre-processed raw materials and thus chemical fingerprint technique is a necessity in the quality monitoring of the raw material.

In this study, multi-step Fourier-transform infrared (FTIR) and liquid chromatography-mass spectrometric (LC-MS) fingerprints of three varieties of *Labisia pumila* (*L. pumila* var. *alata*, *L. pumila* var. *pumila* and *L. pumila* var. *lanceolata*) were developed for the differentiation of the varieties. *Labisia pumila* is locally known as kacip fatimah and its three varieties have been used by women in Malaysia for many years to induce and facilitate childbirth. Apart from that, it is also used for treating menorrhagia (excessive or prolonged menstruation) and as post-partum tonic. The herb belongs to a small genus of slightly woody plants of the family Myrsinaceae and is found in the region from Thailand and Indochina through Peninsular Malaysia to Sumatra, Borneo, Java, Philippines and New Guinea. It grows wild in the lowland or montane Malaysian rainforest in various soil types (i.e. humus-rich soil, sandy loam soil, deep clayed soil and granite acidic soil) at 20 to 1500 m altitude. The three varieties can be distinguished based on the petiole (leaf stalk) characteristics, i.e. broad wing, emarginated wing or terete (no wing). The differentiation can be difficult especially for the layman due to unfamiliarity with the leaf structure parts to be examined to distinguish these varieties. Each variety commands a different use and thus, it is important to ensure that the right variety is used in each case. Therefore, an efficient method for chemical characterization of each variety needs to be developed.

The 1D-FTIR spectroscopic study revealed that the entire spectra were generally similar for the three varieties of *L. pumila* based on their peak positions. More differences were observed in their second derivative FTIR spectra which provided information for better differentiation. The 1D-FTIR spectra of the three varieties of *L. pumila* were further analysed by using Principal Component Analysis (PCA) to perform PC scores plot. From the PC scores plot, samples from var. *alata*, *pumila* and *lanceolata* could be separated from each other in three distinctive groups.



*L. pumila* var. *pumila*



*L. pumila* var. *alata*



*L. pumila* var. *lanceolata*

untuk memperlihatkan perbezaan yang lebih ketara. Spektro 1D-FTIR bagi tiga varieti *L. pumila* seterusnya dianalisis menggunakan *principal component analysis* (PCA) untuk menghasilkan plot skor PC. Plot skor PC sampel daripada var. *alata*, *pumila* dan *lanceolata* boleh dikelaskan ke dalam tiga kumpulan yang berbeza.

Selanjutnya, spektro 2D-FTIR secara visual dan berwarna yang diperoleh menggunakan perubahan suhu bagi menyerlahkan lagi perbezaan di antara ketiga-tiga varieti *L. pumila* dengan lebih berkesan. Maka, pendekatan analisis 2D-FTIR ini mampu membezakan ketiga-tiga varieti tersebut berdasarkan keunikan posisi dan keamatan pada puncak-*auto* (*auto-peaks*) dan puncak-silang (*cross-peaks*) dalam spektro *synchronous*.

Gabungan antara pemisahan HPLC, penyerapan UV, berat molekul serta corak pecahan beresolusi tinggi dan tepat, LC-MS merupakan instrumen yang signifikan untuk pengesahan sebatian yang telah dikenal pasti dan membantu dalam pengenalanpastian sebatian yang belum diketahui. Oleh itu, pengenalanpastian dan penjelasan struktur sebatian kimia daripada tiga varieti menggunakan LC-MS ialah kaedah yang mampu membezakan ketiga-tiga varieti *L. pumila* secara mikroskopik. Kaedah ini berupaya mengenal pasti sebatian kimia yang hadir dalam setiap varieti *L. pumila* berserta formula molekul jangkaan dan disahkan lagi melalui corak isotopiknya. Oleh itu cap-jari LC-MS bagi tiga varieti boleh digunakan sebagai panduan untuk kejayaan kawalan kualiti *L. pumila*.

Kesimpulannya, gabungan cap jari-kimia melalui aplikasi FTIR (makroskopik) dan LC-MS (mikroskopik) boleh digunakan sebagai suatu pendekatan yang sangat baik, berguna dan non-destruktif untuk pengesahan *L. pumila*.

#### Produk Herba Komersial

Penyakit bawaan nyamuk seperti demam denggi sering menyebabkan kematian. Di Malaysia, berdasarkan rekod terkini, kadar insiden demam denggi di negara ini ialah sebanyak 39 264 kes berbanding dengan 33 123 kes yang dilaporkan pada tahun 2009. Kes kematian keseluruhan juga meningkat menjadikan jumlahnya sebanyak 117 berbanding 72 kes pada tahun lalu. (Kenyataan Akhbar Ketua Pengarah Kesihatan Malaysia bagi minggu 41/2010). Menyedari hakikat pentingnya masalah ini ditangani, FRIM khususnya Bahagian Tumbuhan Ubatan yang sentiasa bergiat aktif dalam R&D telah menjalankan penyelidikan saintifik untuk mengenal pasti bahan aktif ataupun ramuan herba semula jadi daripada tumbuh-tumbuhan dalam pelbagai bentuk seperti ekstrak dan minyak pati untuk dimanfaatkan oleh masyarakat.

Furthermore, the visual and colourful 2D-FTIR spectra were obtained by applying thermal perturbation which enhanced the discrimination among the three varieties of *L. pumila* more effectively. The multi-step FTIR macro-fingerprinting was able to distinguish the three varieties based on the unique positions and intensities of the auto-peaks and cross-peaks in the synchronous spectra.

Combining with the HPLC separation, UV adsorption pattern, information of molecular weight as well as fragmentation pattern with high resolution and accuracy, LC-MS has been proven to be a significant analytical tool for the identification of the known compounds and helping in the elucidation of the unknown compounds in complex plant materials. This method enables the simultaneous identification of the major constituents present in each variety of *L. pumila* by high accuracy predicted molecular formula which can be further confirmed by the isotopic patterns generated. Thus the LC-MS fingerprints of the three varieties can form the basis for the successful quality control of *L. pumila*.

The combined approach of macroscopic FTIR and microscopic LC-MS chemical fingerprinting can be used to demonstrate a powerful, useful and non-destructive approach for the authentication of *L. pumila*.

#### Commercial Herbal Products

Mosquito-borne diseases like dengue fever are often fatal. In Malaysia, based on current records, the incidence rate of dengue fever in the country was 39 264 in 2010 compared with 33 123 cases of reported cases in 2009. Deaths have also increased the overall number of 117 as compared with 72 cases in 2010. (Press Statement of the Director General of Health Malaysia for week 41/2010). Recognizing the importance of this issue to be addressed, FRIM, especially the Medicinal Plants Division, which has always been actively involved in R&D, has been carrying out scientific research to identify the active ingredients or remedies of natural herbal plants in various forms such as extracts and essential oils for the benefit of the community.

Among the research activities carried out are those directed to one of the preventive measures to control vector mosquitoes such as *Aedes aegyptii*, vectors of dengue and dengue haemorrhagic fever. Through this study, extracts and essential oils of 30 species were examined for their ability to repel or knock-down the mosquitoes. Amongst the essential oils found to have the potential to repel the *A. aegyptii* mosquito included citronella and citrus oil. Research on these oils showed that their major components consisted of citronellal

Antara aktiviti penyelidikan yang dijalankan ialah menjurus kepada salah satu langkah pencegahan vektor nyamuk seperti *Aedes aegyptii*, vektor penyakit denggi dan denggi berdarah. Melalui kajian ini, ekstrak dan minyak pati daripada 30 spesies tempatan telah dikaji keupayaannya untuk menghalau atau memengsankan nyamuk. Antara minyak pati yang didapati berpotensi untuk menghalau nyamuk *Aedes aegyptii* termasuklah minyak serai wangi dan *Citrus*. Kajian mengenai minyak serai wangi dan *Citrus* mendapati kandungan utamanya adalah terdiri daripada sitronelal dan sitronelol yang menyumbang kepada aktiviti larvisidal yang tinggi. Rentetan daripada itu, FRIM telah berjaya mengenal pasti campuran minyak pati yang bertindak sebagai bahan aktif yang bersesuaian untuk dicampurkan di dalam produk yang boleh dikomersialkan. Bahan aktif ini mampu bertindak untuk menumpaskan nyamuk, penghalau serangga dan juga berpotensi sebagai aromaterapi. Keberkesanan minyak pati ini telah diuji menggunakan kit repelensi [American Society Testing and Materials (ASTM E951-83)] dan kaedah bilik/ruang kaca bersama sukarelawan. Formulasi produk seperti krim dan losyen telah dibangunkan menggunakan bahan aktif ini. Hasil kajian turut diketengahkan melalui beberapa pameran dan pertandingan inovasi serta telah berjaya menarik minat usahawan tempatan untuk bekerjasama dengan pihak FRIM.

Melalui projek usahasama pihak FRIM dengan rakan kerjasama iaitu Syarikat Abadi Industri Sdn Bhd telah berjaya membangunkan satu produk herba aerosol berjenama *Yaqin*. Produk ini telah dilancarkan oleh Tan Sri Datuk Seri Panglima Joseph Kurup, Timbalan Menteri, NRE pada 3 Ogos bersempena dengan majlis pembukaan Seminar Tumbuhan Ubatan yang ke-12 (MAPS 2010) anjuran FRIM. Kini, produk ini telah menembusi pasaran dan sedang dipasarkan di pasar raya besar di seluruh negara. Berdasarkan kaji selidik yang telah dijalankan oleh pihak syarikat, produk ini telah diterima pakai oleh pelbagai kaum. Ini merupakan salah satu usaha dalam mencegah penularan wabak denggi menggunakan produk berasaskan herba tempatan.

and citronellol, which may contribute to the strong larvicidal activity. Consequently, FRIM has succeeded in identifying a blend of essential oils which can act as active ingredients in technical products. These active ingredients are capable of repelling insects, defeating mosquitoes, and also providing aromatherapy purposes. The effectiveness of the essential oils was tested using a repellency kit [American Society Testing and Materials (ASTM E951-83)] and the method of room/glass chamber with volunteers. Product formulations such as creams and lotions have been developed using this active ingredient. The output of the research has been highlighted in several exhibitions and innovation competitions and has thus successfully attracted local entrepreneurs to work together with FRIM.

Through a joint venture with Abadi Industri Sdn Bhd, an aerosol herbal-based product *Yaqin* has been developed. This product was launched by Tan Sri Datuk Seri Panglima Joseph Kurup, Deputy Minister of NRE, on 3 August in conjunction with the opening of the 12th Seminar on Medicinal Plants (MAPS 2010) organized by FRIM. Currently this product has penetrated the market and being sold in major supermarkets across the country. Based on a survey conducted by the company, this product has been adopted by many peoples. It is an effort to prevent the spread the dengue using local herbal ingredients.



Produk *Yaqin*  
*Yaqin* product



Pelancaran produk *Yaqin*  
Launching of *Yaqin* products

## Potensi Perencat dan Pengubahsuai-Kerintangan Flavonoid dari *Chromolaena odorata* dan Terbitannya Terhadap *Staphylococcus aureus* Rintang-Metisilin (MRSA) Pencilan Klinikal

*Staphylococcus aureus* rintang-metisilin (MRSA) telah menjadi punca utama jangkitan nosokomial di dunia dan salah satu daripada bakteria yang susah dan sukar untuk diatasi. Rawatan terhadap jangkitan ini telah menjadi lebih sukar sejak MRSA menjadi rintang terhadap pelbagai antibiotik yang mempunyai struktur yang berlainan membuatkan ia sebagai MRSA rintang-pelbagai ubat. Oleh sebab itu, pencarian sumber antimikrob yang baharu atau alternatif amatlah diperlukan untuk menghalang atau setidak-tidaknya mengurangkan jangkitan MRSA. Dalam kajian ini, 11 pencilan bakteria dari Hospital Sultanah Nur Zaharah (HSNZ), Kuala Terengganu telah diciri menggunakan kaedah fenotipik dan genotipik. Satu antibiogram dihasilkan menunjukkan semua pencilan yang diuji memperlihatkan profil rintang-pelbagai ubat terhadap lebih daripada dua kelas antibiotik. Hasil PCR menunjukkan hampir semua pencilan MRSA mengandungi tiga gen efluks. Dengan membandingkan hasil PCR dan profil antibiogram, pencilan yang paling kurang rintang-pelbagai ubat juga mempunyai kurang bilangan gen efluks yang dikesan. Di samping itu, cuma lima daripada 11 pencilan menunjukkan aktiviti efluks yang aktif. Daripada lapan terbitan flavonoid yang disintesis, dua sebatian mempamerkan aktiviti perencatan yang sederhana sementara dua lagi sebatian memperlihatkan potensi perencatan efluks yang baik terhadap pencilan yang diuji. Kajian hubungan-struktur-aktiviti (SAR) membayangkan aktiviti yang diperhatikan dikawal oleh kehadiran kumpulan fenolik dan tahap lipofilik yang tertentu. Semua lima sebatian mempunyai potensi sebagai ramuan aktif untuk aktiviti pembangunan produk yang selanjutnya.

## Eksplorasi Diversiti Mikrob Aktinobakteria Malaysia Menggunakan Primer Spesifik-Genus untuk Penemuan Antibiotik

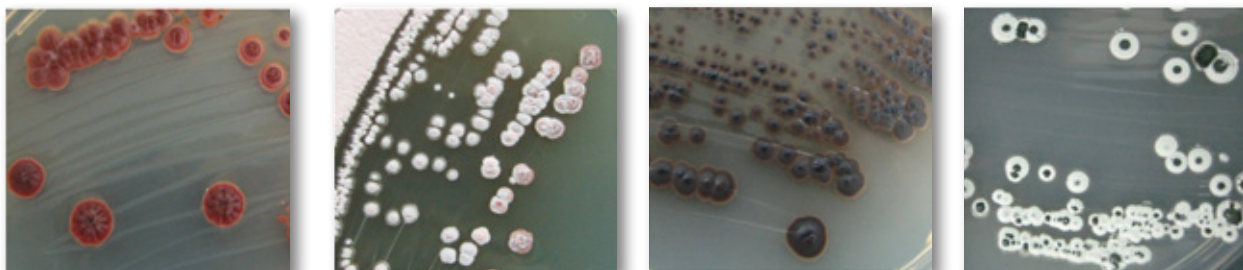
Malaysia dikenali sebagai salah satu daripada 12 kawasan diversiti terkaya di dunia dengan kepelbagaian flora, fauna serta mikroflora. Di bawah projek saintifik biayaan MOSTI yang bertajuk “*Exploratory studies of actinobacteria biodiversity of FRIM forests in aid of drug discovery*”, kajian ke atas diversiti aktinobakteria menunjukkan bahawa sampel tanah hutan Malaysia kaya dengan kumpulan unik bakteria berfilamen ini yang sangat penting dalam industri farmaseutikal. Walau bagaimanapun, apabila bilangan antibiotik yang ditemui daripada kultur mikrob aktinobakteria semakin meningkat,

## Resistance-Modifying and Inhibitory Potential of Flavonoids from *Chromolaena odorata* and Its Derivatives against Methicillin-Resistant *Staphylococcus aureus* (MRSA) Clinical Isolates

Methicillin-resistant *Staphylococcus aureus* (MRSA) has become the main cause of nosocomial infections in the world and one of the hardest and difficult bacteria to overcome. Treatment of these infections has become more difficult since MRSA has become resistant to various structurally-unrelated antibiotics making it into a multidrug-resistant pathogen. Thus, there is a dire need for a new and alternative source of antimicrobials to prevent or at least reduce MRSA infections. In this study, 11 bacterial isolates from Hospital Sultanah Nur Zaharah (HSNZ), Kuala Terengganu, were characterized as MRSA using both phenotypic and genotypic methods. An antibiogram generated showed that all of the isolates tested exhibited multidrug-resistance profile against more than two classes of antibiotics. PCR results showed that most of the MRSA clinical isolates contained all three efflux genes. By comparing the PCR result with the antibiogram profile, the least multidrug resistant isolate has also the least efflux genes detected. Additionally, only five out of the 11 isolates showed active efflux activity. From the eight flavonoid derivatives synthesized, three compounds exhibited moderate inhibitory activity while another two compounds displayed good efflux inhibitory potential against the test isolates. Structure-activity-relationship (SAR) studies suggest that the activity observed was governed by the presence of phenolic groups and a certain degree of lipophilicity of the respective compounds. All five compounds have the potential as an active ingredient/s for further product development activity.

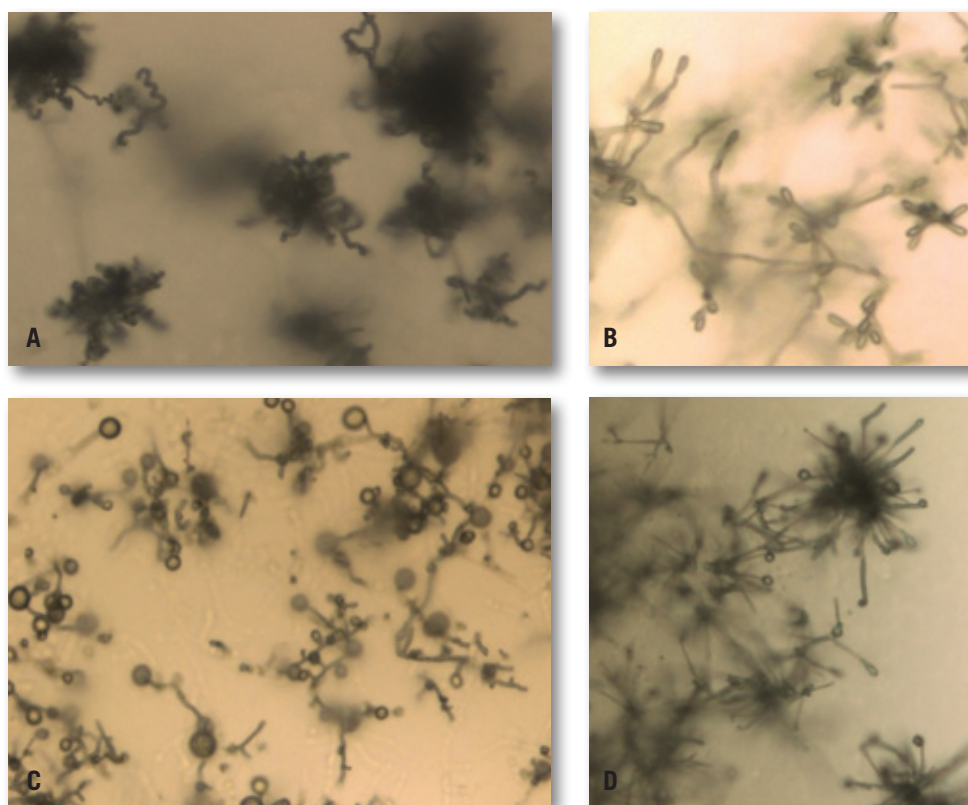
## Exploration of Malaysian Actinobacteria Diversity Using Genus-Specific Primers for Antibiotics Discovery

Malaysia is known as one of the world's 12 hotspots for biodiversity and is richly endowed with diverse flora, fauna and associated microflora. Within a scientific project funded by MOSTI entitled “*Exploratory Studies of Actinobacteria Biodiversity of FRIM Forests in Aid of Drug Discovery*”, mapping of actinobacteria diversity reveals that Malaysian soil samples collected from rainforests contain abundance of rare groups of these industrially important filamentous bacteria. As more new antibiotics were discovered from actinobacteria, the chances of finding novel antibiotics lead compounds among the more commonly occurring genera have dwindled. The focus of industrial screening has therefore moved to species belonging to the less exploited genera or rare actinobacteria.



Pelbagai morfologi koloni bagi aktinobakteria oligosporik yang tumbuh di atas media ISP2 pada suhu 28°C selama 7–14 hari

Various colony morphologies of oligosporic actinobacteria grown on ISP2 media at 28°C for 7–14 days



Mikrograf (300 X pembesaran) beberapa spesies daripada famili Streptosporangiaceae; A: *Nonomuraea* sp., B: *Planomonospora* sp., C: *Streptosporangium* sp., dan D: *Herbidospora* sp.  
Light micrographs (300 X magnification) of some species from Streptosporangiaceae family; A: *Nonomuraea* sp., B: *Planomonospora* sp., C: *Streptosporangium* sp., and D: *Herbidospora* sp.

semakin rendah kebarangkaliannya untuk menemui sebatian pemula antibiotik yang baharu daripada genus-genus yang biasa terpencil daripada sampel biologi. Oleh itu, aktiviti penyaringan industri kini lebih fokus kepada genus aktinobakteria yang unik ataupun sukar dipencil.

Perhatian khusus diberikan kepada spesies aktinobakteria daripada famili Streptosporangiaceae yang terbukti sebagai sumber bernilai dalam penghasilan sebatian berpotensi untuk dijadikan antibiotik. Namun begitu, eksploitasi kumpulan mikrob ini masih dalam peringkat awal. Famili Streptosporangiaceae ini termasuklah 10 genus iaitu *Nonomuraea*, *Streptosporangium*, *Sphaerosporangium*, *Microtetraspora*, *Microbispora*, *Planomonospora*, *Planobispora*, *Planotetraspora*, *Herbidospora* dan *Acrocarpospora*. Salah satu contoh metabolit sekunder baharu yang telah dipencilkan daripada famili ini ialah sekumpulan sebatian baharu yang dikenali sebagai bispolidides A1, A2, A3, B1, B2a, B2b dan B3 yang didapati daripada kultur *Microbispora* sp. A34030 yang dipencil dari tanah hutan FRIM (Malaysian Patent Application No. PI 20062247). Kejayaan yang dicapai melalui projek kerjasama FRIM ini turut menjadi penyebab utama dalam menentukan fokus kajian ke atas metabolit yang dihasilkan oleh kumpulan sasaran *Nonomuraea*, *Microbispora* dan genus lain yang berkait rapat.

Di bawah projek MOSTI yang lepas, sejumlah 2286 aktinobakteria telah dipencilkan daripada tanah hutan dan stesen penyelidikan FRIM. Mikrob-mikrob ini kini dikaji untuk memilih genus sasaran sebagai sumber mikrob dalam kajian penyaringan sebatian kimia untuk aktiviti antibakteria

Specific attention was given to strains belonging to the family Streptosporangiaceae as they prove to be a valuable source of potentially useful antibiotics although exploitation of this group is still at its infancy. The family includes ten genera, namely *Nonomuraea*, *Streptosporangium*, *Sphaerosporangium*, *Microtetraspora*, *Microbispora*, *Planomonospora*, *Planobispora*, *Planotetraspora*, *Herbidospora* and *Acrocarpospora*. One example of novel secondary metabolites isolated from this family is a group of new related compounds named bispolidides A1, A2, A3, B1, B2a, B2b and B3 found in a culture of *Microbispora* sp. A34030 isolated from FRIM forest soil (Malaysian Patent Application No. PI 20062247). The success achieved through this FRIM collaborative research led us to further focus on studying metabolites produced by the target groups *Nonomuraea*, *Microbispora* and related genera.

A total of 2286 isolates of soil actinobacteria isolated from FRIM forest and substations under the previous MOSTI project were studied to select targeted genera to screen for interesting antibacterial and antiprotozoal compounds. Members of the Streptosporangiaceae family can be distinguished from other genera by using combination of chemical and morphological markers, though the procedures involved are laborious and time-consuming. Therefore, the use of specific DNA probes as selective amplification primers in this study offers a practical way of rapidly identifying large numbers of strains from the selected genera. Genus-specific oligonucleotides have been designed for the one-step identification of strains belonging to *Nonomuraea* and related genera through the selective amplification of partially purified genomic DNA. In this experiment, primer pairs *NomF2* and *NomR3* were used to

dan antiprotozoa yang kuat. Ahli-ahli daripada famili Streptosporangiaceae boleh dibezakan daripada genus yang lain dengan menggunakan kombinasi penanda kimia dan morfologi. Namun begitu, prosedur sedemikian adalah sangat panjang dan akan mengambil masa yang lama. Oleh itu, kegunaan probe DNA spesifik dalam kajian ini sebagai primer bagi amplifikasi selektif, menyediakan kaedah praktikal untuk pengecaman sejumlah besar pencilan sebagai genus sasaran. Oligonukleotida spesifik-genus telah dibina untuk tujuan pengecaman cara pantas bagi pencilan-pencilan *Nonomuraea* dan genus yang berkait rapat melalui amplifikasi selektif DNA genom separa tulen. Dalam eksperimen ini, pasangan primer *NomF2* dan *NomR3* telah digunakan untuk menyaring 336 pencilan actinobacteria yang mempunyai morfologi kultur oligosporik dengan pantas. Sejumlah 255 pencilan telah berjaya ditentukan sebagai genus sasaran melalui kaedah amplifikasi PCR menggunakan primer spesifik-genus. Daripada jumlah itu, kajian penyaringan mikrob yang dijalankan telah mengenal pasti 29 pencilan yang menghasilkan sebatian kimia dengan aktiviti antibakteria. Manakala 10 pencilan menghasilkan sebatian kimia dengan aktiviti antiprotozoa yang kuat dan selektif. *Nonomuraea* dan genus yang berkait rapat dengannya boleh dipencilkan dalam jumlah yang besar daripada tanah hutan Malaysia. Oleh itu, kumpulan mikrob ini dipercayai menyediakan sumber penting untuk dieksploitasi dan Malaysia mempunyai peluang untuk menyumbang ke arah bidang penemuan ubatan dan bioteknologi melalui penyaringan mikrobiota ini.

#### **Pengaruh Tetraploid Secara *In Vitro* Bagi *Acacia*: Ke Arah Pembangunan Pokok Triploid Tanpa Biji untuk Malaysia**

*Acacia mangium*, *A. auriculiformis* dan hibrid *Acacia* F<sub>1</sub> kini semakin banyak ditanam sebagai pokok hutan ladang di seluruh Malaysia dan Asia tropika. Namun begitu, penanaman *Acacia* Australia yang eksotik secara besar-besaran juga meninggalkan kesan negatif kerana sifat perintis pokok-pokok ini menyebabkannya senang tumbuh sebagai rumpai di luar batasan ladang. Satu strategi untuk mengatasi sifat rumpai *Acacia* ialah dengan membangunkan pokok *Acacia* triploid yang mandul secara klon untuk perhutanan. Berbanding dengan diploid, triploid mempunyai kesuburan yang terhad kerana padanan kromosom triploid yang tidak serata menghalang pembentukan gamet atau endosperma yang normal. Di samping mengatasi masalah rumpai, kemandulan triploid menjadikannya calon yang sesuai untuk modifikasi genetik tanpa risiko pencemaran gen. Selain itu, triploid juga berkelebihan (contoh: kadar tumbesaran yang lebih tinggi) berbanding dengan diploid seperti yang dilihat dalam pokok perhutanan lain seperti *Populus*.

Pengaruh tetraploid tiruan merupakan langkah pertama dalam proses pembangunan bahan tanaman triploid. Tetraploid yang telah dihasilkan kemudiannya boleh dikacukkan dengan diploid untuk menghasilkan progeni triploid yang bersifat mandul. Tetraploid tiruan boleh dihasilkan dengan merawat tisu diploid yang giat tumbuh (contoh: embrio, meristem) dengan perencat mitosis seperti kolkisin. Perencat mitosis dapat menghasilkan sel dan tisu tetraploid dengan merencatkan pembentukan spindle fiber lalu menghalang pemisahan kromosom homologous semasa

rapidly screen through 336 isolates grouped as oligosporic-morphology. A total of 255 isolates were successfully confirmed to be members of *Nonomuraea* and related genera by Polymerase Chain Reaction (PCR) amplification using the genus-specific primers. Total of 29 *Nonomuraea* isolates were found to produce compounds showing potential antibacterial activity and 10 showed very strong and selective antiprotozoal activities. Strains from the *Nonomuraea* and related genera can be isolated in quite large numbers from Malaysian forest soils and are expected to provide valuable resources for exploitable biology. Therefore, there is an exciting opportunity within Malaysia to make contributions to the field of drug discovery and other areas of biotechnology through the acquisition and screening of this microbiota.

#### ***In-Vitro* Tetraploid Induction of *Acacia*: Towards the Development of Seedless Triploid Trees for Malaysia**

*Acacia mangium*, *A. auriculiformis* and their F<sub>1</sub> hybrid are widely grown as plantation forestry crops throughout Malaysia and tropical Asia due to their fast growth and wide site adaptability. However, the large-scale cultivation of exotic Australian *Acacia* is not without consequences as the pioneering nature of these crops means that they can easily spread beyond the confines of plantations and behave as weeds. One possible strategy to overcome the weedy potential of *Acacia* is to develop sterile triploid *Acacia* for deployment in clonal forestry. Triploids have a greatly reduced fertility compared with diploids due to uneven chromosome complement which prevents normal gamete or endosperm formation. In addition to reducing problems of weediness, their near sterility would also make triploids an attractive candidate for genetic modification without the risk of genetic pollution. Moreover, it is anticipated that this approach may also potentially result in other benefits as triploids sometimes have superior traits (e.g. larger size, faster growth) compared with diploids, as has been observed in other commercial forestry trees such as *Populus*.

One feasible approach for obtaining triploids involves inducing artificial tetraploid plants which can later be crossed with diploid plants to obtain triploid progeny. Tetraploids may be artificially induced by treating mitotically active diploid tissue (e.g. embryos, meristems etc.) with anti-mitotic agents such as colchicine. By inhibiting the formation of spindle fibres, anti-mitotic agents prevent the separation of homologous chromosomes during mitosis which results in the formation of tetraploid cells and tissues. Vegetative propagation techniques such as *in-vitro* culture can then be employed to regenerate tetraploid tissues into fully tetraploid plants. The artificial induction of tetraploids in *Acacia* for the purpose of developing seedless triploids is currently the subject of several international studies.

A study was initiated by the Tissue Culture Laboratory for the purpose of developing *in vitro* tetraploid induction techniques for producing tetraploid clones from the commercial *in vitro* *Acacia* clone collection maintained at FRIM. In the first part of study, flow cytometry (FCM) DNA ploidy screening parameters were compared to determine the best parameters for detecting tetraploids from *in-vitro* *Acacia* cultures. The optimized FCM DNA ploidy screening technique was then used to compare

proses mitosis. Teknik seperti kultur *in vitro* kemudiannya boleh digunakan untuk menjana pokok tetraploid daripada tisu tetraploid ini. Pengaruh tetraploid tiruan untuk penghasilan bahan tanaman triploid kini banyak dikaji oleh penyelidik antarabangsa.

Kajian ini telah dimulakan di Makmal Kultur Tisu bertujuan untuk membangunkan teknik induksi tetraploid secara *in vitro* bagi menghasilkan klon tetraploid *Acacia* daripada koleksi klon *Acacia* komersial di FRIM. Dalam bahagian pertama kajian ini, parameter untuk teknik aliran sitometri DNA bagi mengesan tetraploid daripada kultur *in vitro* *Acacia* melalui penggunaan aliran sitometri telah dikenal pasti. Setelah mengenal pasti teknik yang terbaik bagi spesis *Acacia*, penentuan skala kepekatan kolkisin yang berkesan dan masa pendedahan paling sesuai pula dilaksanakan bagi mendapatkan ploidi berganda. Setakat ini, miksploid putatif yang mengandungi campuran tahap ploidi (sitokimera yang terdiri daripada campuran sel diploid dan sel tetraploid) telah dibangunkan. Analisis awal ke atas data yang diperolehi telah memberi petunjuk yang penting dalam memahami kesan kepekatan kolkisin dan masa pendedahan minimum yang diperlukan dalam penghasilan tetraploid *Acacia*. Beberapa eksperimen lanjutan kini sedang dijalankan untuk menghasilkan klon *Acacia* yang sepenuhnya daripada sel tetraploid.

### **Pencarian Sebatian Aktif Tumbuhan yang Berpotensi sebagai Agen Menentang Kanser**

Kanser merupakan ancaman di kalangan manusia kerana masih tiada lagi rawatan menyeluruh untuk merawatnya terutamanya jika ia lambat dikenal pasti. Oleh itu, rawatan kemoterapi masih menjadi rawatan utama untuk merawat penyakit kanser yang telah teruk untuk membantu memanjangkan sedikit jangka hayat seseorang pesakit. Masalah dadah kemoterapi yang adalah kejadian kerintangan terhadap dadah kemoterapi dan juga masalah ketoksikan. Dengan adanya tumbuh-tumbuhan dan kepelbagaian sumber asli di Malaysia, pencarian sebatian-sebatian bioaktif (sebatian-sebatian sasaran) yang ditindakkan ke atas satu panel titisan sel-sel kanser masih dijalankan di FRIM yang sehingga kini sekurang-kurangnya 312 ekstrak telah dicerakinkan. Projek bertajuk 'Proteomic Assessments of Bioactive Constituent from Selected Malaysian Plant Species with Anti-Breast Cancer and Anti-Ovarian Cancer Potentials' baru sahaja selesai dijalankan dengan pembiayaan daripada dana ScienceFund MOSTI. Objektif utama projek tersebut adalah untuk mengenal pasti sebatian sasaran untuk dibangunkan sebagai sebatian pemula bersifat antikanser dan juga sebagai agen kemoterapeutik.

Asai viabiliti sel Sulforhodamine B (SRB) telah dijalankan untuk menilai aktiviti antikanser secara *in vitro* melalui analisis  $IC_{50}$  terhadap ekstrak methanol yang aktif yang diperolehi daripada tumbuh-tumbuhan daripada kajian yang terdahulu. Sampel yang diuji yang terdiri daripada ekstrak dan sebatian sasaran yang tulen diklasifikasikan sebagai aktif terhadap titisan-titisan sel kanser terpilih apabila mempunyai nilai  $IC_{50}$  masing-masing kurang daripada  $20 \mu\text{g ml}^{-1}$  dan  $4 \mu\text{g ml}^{-1}$  berdasarkan kriteria yang digunakan oleh pihak *National Cancer Institute*, AS. Di kalangan ekstrak-ekstrak methanol dan etil asetat yang diperolehi daripada lima jenis tumbuh-tumbuhan, ekstrak yang diperolehi daripada famili

the efficacy of a range of colchicine concentrations at various exposure times for inducing ploidy doubling in *in-vitro* *Acacia* shoot tips. Putative DNA mixoploids (cytochimeras composed of diploid and tetraploid cells) have been developed so far and preliminary analysis of data provided valuable insights into the minimal colchicine concentration and exposure periods necessary for producing tetraploid *Acacia*.

### **In Search of a Plant-Derived Hit Compound as Potential Anti-cancer Agent**

Cancer still remains a threat among us due to there being still no comprehensive cure for treating the disease especially when it is diagnosed at a late stage. Thus, chemotherapy still remains the main modality of treatment for treating the advanced stage of cancer that helps to extend the patient's survival time. The challenges to the current chemotherapy drugs are the development of drug resistance and toxicity problems. With vast amounts of plant and natural resources available in Malaysia, the search for bioactive compounds (hit compounds) against a panel of cancer cell lines is still ongoing in FRIM with 312 extracts been screened thus far. Recently, a project entitled "Proteomic Assessments of Bioactive Constituent from Selected Malaysian Plant Species with Anti- Breast Cancer and Anti-Ovarian Cancer Potentials" has been completed under the grant number 02-03-10-SF0057 received from MOSTI's ScienceFund. This project was aimed at identifying the hit compounds towards the development of new potential anti-cancer lead compounds and as chemotherapeutic agent.

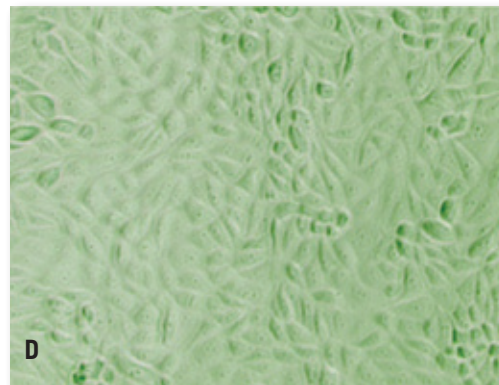
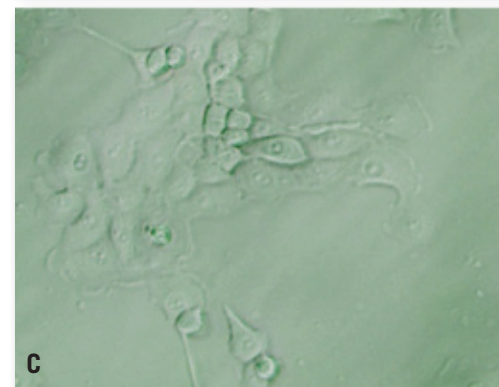
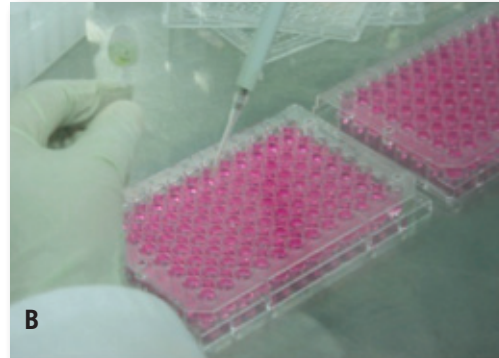
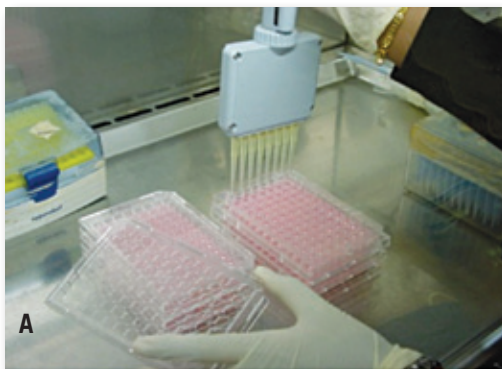
A cell viability assay Sulforhodamine B (SRB) was performed to evaluate the anti-cancer activities *in vitro* by  $IC_{50}$  evaluations on the plant-derived methanolic active extracts obtained from the previous studies. The sample when tested in the form of extract and pure compound against selected cancer cell lines is classified as active when the  $IC_{50}$  is less than  $20 \mu\text{g ml}^{-1}$  and  $4 \mu\text{g ml}^{-1}$  respectively based on the criteria used by the National Cancer Institute, USA. Among five plants-derived methanolic and ethyl acetate extracts, the extract which belongs to Apocynaceae family was selected towards isolation of its hit compound due to it being the most active in exerting significant anti-cancer activity with its mean  $IC_{50}$  value less than  $5 \mu\text{g ml}^{-1}$ . Through bioassay guided fractionation and isolation steps, a compound coded as SNA209 was chemically characterized via 1D/2D NMR and ESI MS/MS and identified to belong to the cardiac glycosides family. The anti-cancer activities of SNA209 against breast cancer cell lines (MCF7 & T47D) and ovarian cancer cell lines (SKOV3 and CaOV3) when evaluated using  $IC_{50}$  values were  $0.017 \mu\text{M}$ ,  $0.021 \mu\text{M}$ ,  $0.032 \mu\text{M}$  and  $0.024 \mu\text{M}$  respectively. In comparison, one of the existing chemotherapy drugs used for breast cancer treatment known as tamoxifen when treated on these cancer cell lines gives the  $IC_{50}$  values of  $13.7 \mu\text{M}$ ,  $14.3 \mu\text{M}$ ,  $13.2 \mu\text{M}$  and  $13.5 \mu\text{M}$  respectively. Thus it shows that SNA209 is 400 to 800 times more active than tamoxifen.

An invention disclosure was filed for this finding under ref. No. FRIM ID 19-09 and the patent filing number (PI 2010003141) was granted by MyIPO in July 2010. The project has also successfully produced three published papers (one in a scientific journal and two in proceedings) recently.

*Apocynaceae* telah dipilih ke arah pengasingan sebatian sasaran kerana ia paling aktif dengan nilai purata  $IC_{50}$  kurang daripada  $5 \mu\text{g ml}^{-1}$ . Melalui kaedah dan langkah bioasai berpandukan fraksinasi dan pengasingan, sebatian sasaran berkod SNA209 telah berjaya dicirikan melalui kaedah 1D/2D NMR dan ESI MS/MS dan dikenal pasti tergolong di dalam famili glikosida kardiak. Aktiviti antikanser SNA209 terhadap titisan sel kanser payudara (MCF7 dan T47D) dan titisan sel kanser ovari (SKOV3 & CaOV3) yang dinilai melalui  $IC_{50}$  masing-masing ialah  $0.017 \mu\text{M}$ ,  $0.021 \mu\text{M}$ ,  $0.032 \mu\text{M}$  dan  $0.024 \mu\text{M}$ . Manakala aktiviti antikanser oleh salah satu dadah kemoterapi yang digunakan untuk merawat kanser payudara apabila diuji ke atas ke empat-empat titisan sel kanser di atas dengan nilai  $IC_{50}$  masing-masing ialah  $13.7 \mu\text{M}$ ,  $14.3 \mu\text{M}$ ,  $13.2 \mu\text{M}$  dan  $13.5 \mu\text{M}$ . Ini menunjukkan bahawa SNA209 adalah antara 400 hingga 800 lebih aktif berbanding tamoksifen.

Hasil kajian ini, satu pendedahan reka cipta di FRIM bernombor FRIM ID 19-09 dan juga satu pemfailan paten daripada MyIPO telah diperolehi pada bulan Julai 2010 (PI 2010003141). Tiga kertas kerja berjaya dihasilkan dan diterbitkan (satu di dalam jurnal saintifik dan dua lagi di dalam prosiding). Kajian yang lebih mendalam terhadap potensi antikanser oleh sebatian SNA209 akan diteruskan untuk melakukan penilaian terhadap molekul sasaran dan kesan ketoksikannya di peringkat *in vitro*, *in vivo* dan *in silico* yang berkemungkinan dapat memperkenalkan potensi SNA209 sebagai agen terapeutik untuk pembangunan biofarmaseutikal bagi rawatan kanser.

In-depth studies of the anti-cancer properties of SNA209 compound will be continued so as to evaluate its molecular targets and toxicity effects at *in-vitro*, *in-vivo* and *in-silico* levels by which the studies might expand the possibilities of introducing the SNA209 as a potential novel therapeutic agent for biopharmaceutical development in cancer therapy.



Sebahagian daripada eksperimen penyelidikan antikanser. Sel-sel kanser yang diperolehi daripada 'American Type Culture Collection' dikultur di dalam plat 96 telaga (a) dan dirawat dengan ekstrak dan sebatian aktif tumbuh-tumbuhan (b). Sel-sel kanser yang dilihat di bawah mikroskop menunjukkan kebanyakan daripada sel-sel yang dirawat dengan ekstrak tumbuhan yang aktif telah mati (c) berbanding dengan kebanyakan sel-sel yang tidak dirawat masih hidup (d).

Part of the anti-cancer research experiment. Cancer cells obtained from American Type Culture Collections were cultured in 96 well plates (a) and treated with the plant extracts and compounds (b). Cancer cells were observed under a microscope showed that many cells had died after being treated with the active plant extract as in (c) compared with the many cells remaining intact without the treatment as in (d).

## Pensijilan *Chain-of-Custody* dan Forensik Pemprofilan DNA ke Atas Ramin

Pembalakan haram dan penyeludupan spesies *Gonystylus bancanus* (Thymelaeaceae) atau nama tempatannya ramin melawis menjadi semakin serius dan memberi ancaman kepada spesies balak paya gambut yang sangat bernilai ini. Dijangkakan spesies ini akan terancam di masa depan, *Convention on International Trade of Endangered Species* (CITES) telah menyenaraikan ramin melawis di bawah Apendiks II. Kelulusan perdagangan antarabangsa bagi spesimen Apendiks II hanya boleh dikeluarkan melalui permit eksport atau sijil eksport semula CITES. Dalam konteks pembalakan haram dan pensijilan 'chain-of-custody', kandungan unik DNA boleh digunakan sebagai perkakasan untuk mengesan dan memantau kesahihan balak yang dicurigai dari segi undang-undang. Dengan menggunakan 17 populasi semula jadi ramin melawis dari Malaysia Barat (Semenanjung Malaysia) dan Malaysia Timur (Sabah dan Sarawak), pangkalan data pengecaman populasi dan individu masing-masing dijana menggunakan penanda DNA kloroplas dan mikrosatelit.



## Chain of Custody and Forensic DNA-Profiling of Ramin

Illegal logging and smuggling of *Gonystylus bancanus* (Thymelaeaceae), locally known as ramin melawis, have become rampant and pose a threat to this fragile valuable peat swamp timber species. Ramin melawis has been listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II as it is expected that this species might become threatened in the near future. International trade in specimens of Appendix II species may be authorized by the granting of an export permit or re-export certificate. The inbuilt unique properties of DNA within the timber could serve as a tracking and monitoring tool to verify the legality of a suspected timber in the context of illegal logging and chain-of-custody certification. By using 17 natural populations of ramin melawis throughout West Malaysia (Peninsular Malaysia) and East Malaysia (Sabah and Sarawak), the population and individual identification databases were developed using chloroplast DNA and microsatellite markers respectively.



(A) Warna kayu ramin melawis (B) Buah ramin melawis  
(A) The wood colour of ramin melawis, (B) Fruits of ramin melawis

Bagi tujuan *chain-of-custody* atau pengecaman populasi, satu peta taburan haplotip bagi seluruh Malaysia telah dihasilkan untuk ujian kebenaran berdasarkan kepada enam kawasan DNA kloroplas (intergenic spacers - *psbM-trnD*, *trnG-rps14*, *trnK-rps16*, *trnE-trnT*, *ycf9-trnG* and *rpoC1-2*). Dua belas haplotip telah dikenal pasti daripada 36 lokasi interspesifik yang berbeza. Keputusan menunjukkan kawasan Barat dan Timur Malaysia dapat dibezakan dengan jelas. Ujian statistik berdasarkan kehadiran/ketiadaan haplotip telah digunakan untuk menguji sama ada balak yang dicurigai dapat disahkan kepada kawasan asal ia dibalak. Secara keseluruhan, ralat jenis I dan II hasil simulasi pangkalan populasi menunjukkan keputusan yang baik dengan 5% tahap ramalan. Ini bermakna pangkalan data perbandingan ini boleh digunakan untuk mengesan asal usul balak sama ada dari kawasan barat atau timur Malaysia.

Di samping itu, sebanyak 16 penanda mikrosatelit telah digunakan untuk membangunkan pangkalan data pemprofilan DNA ramin melawis. Analisis kluster genetik membahagikan kesemua 17 populasi ramin melawis kepada dua kluster, selaras dengan kedudukan geografi kawasan barat dan

For chain-of-custody or population identification, a haplotype distribution map of Malaysia was generated for authenticity testing based on six chloroplast DNA markers (the intergenic spacers of *psbM-trnD*, *trnG-rps14*, *trnK-rps16*, *trnE-trnT*, *ycf9-trnG* and *rpoC1-2*). Twelve haplotypes were identified from 36 significant intraspecific variable sites. The results revealed that the regions of West and East Malaysia were clearly distinguishable. Statistical procedure based on the composition of the wood lot was used to test whether a suspected timber conforms to a given regional origin. Overall, the observed Types I and II errors of the database showed good concordance with the predicted 5% threshold, which might indicate that the database is useful to reveal provenance and establish conformity of wood lot from the western and eastern regions of Malaysia.

Subsequently, sixteen microsatellites were used to develop the DNA profiling databases for ramin melawis. Genetic cluster analyses divided the 17 populations into two main clusters, corresponding to the regions of West and East Malaysia. Therefore, the DNA profiling databases were characterized at the levels of region and Malaysia. The conservativeness

timur Malaysia. Oleh itu, pangkalan data pemprofilan DNA telah dicirikan pada peringkat populasi dan Malaysia. Ujian pencirian konservatif menunjukkan pangkalan data barat dan timur Malaysia adalah konservatif menunjukkan kedua-dua pangkalan data ini dapat memberi bukti undang-undang dalam prosiding mahkamah terhadap pembalok haram di Malaysia.

Dengan kewujudan pangkalan data DNA seperti ini, kapasiti pegawai Jabatan Perhutanan dalam menangani masalah pembalakan haram dan isu persijilan *chain-of-custody* akan dipertingkatkan. Ini secara tidak langsung akan memastikan keberkesanan pemuliharaan dan penggunaan lestari sumber hutan di Malaysia.

### **Projek Perdagangan Domestik Kayu dan Produk Berasaskan Kayu**

Survei awalan di Semenanjung Malaysia meliputi 9038 unit telah dijalankan bermula pada November 2009. Manakala survei lengkap dijalankan ke atas 780 unit (8.6% sampel) merangkumi pelbagai kategori, saiz dan lokasi. Hasil kajian mendapati jumlah input untuk perdagangan domestik kayu dan produk berasaskan kayu bernilai RM15 bilion. Jumlah output pula bernilai RM24 bilion. Nilai ini setanding dengan sektor televisyen/radio/video dan produk berasaskan getah. Manakala jumlah nilai tambah pula mencapai RM13 bilion. Kajian juga mendapati bagi setiap RM1 kayu yang digunakan untuk perdagangan domestik, ia berupaya menghasilkan nilai langsung limpahan sebanyak RM0.15 kepada sektor lain seperti elektrik, pembungkusan dan minyak. Dalam aspek pekerjaan pula, sebanyak 114 000 pekerja tetap dan 24 000 bukan pekerja tetap terlibat dengan perdagangan domestik kayu dan produk kayu dengan pendapatan purata sebanyak RM1200/orang/bulan. Sebanyak 96% syarikat yang terlibat dengan perdagangan domestik merupakan syarikat kecil yang mempunyai pekerja kurang daripada lima orang. Sistem rantaian pula didominasi oleh beberapa kawasan seperti Lembah Klang, Ipoh, Pulau Pinang, Muar, dan Batu Pahat.

Kajian ini mendapati data rasmi berkaitan perdagangan domestik produk kayu dan data yang dikumpul melalui survei berbeza, bukan kerana aktiviti haram dalam sektor tersebut, tetapi kerana ketiadaan statistik. Ini kerana prosedur pengumpulan data statistik tidak memantau sektor perdagangan domestik kayu secara menyeluruh. Projek ini membentangkan metodologi yang boleh digunakan bagi memantau dan menilai perdagangan tempatan kayu dan produk berasaskan kayu secara berterusan.

tests showed that the West and East Malaysia databases were conservative suggesting that both databases could be used to provide legal evidence for court proceedings against illegal loggers in Malaysia.

The availability of DNA profiling and geographical traceability databases for the majority of important timber species in Malaysia would enhance the capacity of Forest Department officials to curb the problem of illegal logging, and the issue of chain-of-custody certification. This will indirectly ensure the conservation and sustainable utilization of forest resources in Malaysia.

### **Project on Domestic Trade in Timber and Timber Products**

Preliminary survey in Peninsular Malaysia was conducted included 9038 units began in November 2009. A complete survey conducted on 780 units (8.6% of samples) covering the various categories, sizes and locations of companies which involved in domestic trade of timber and timber products. The study found the number of inputs for domestic trade of timber and timber products worth RM15 billion. Total output was valued at RM24 billion. This value is comparable to the television / radio / video and rubber products (Report on Annual Survey of Manufacturing Industries 2009). While the total value added has reached RM13 billion. The study also found that for every RM1 the wood used for domestic trade, it has spillover effect of RM0.15 to other sectors such as electrical, packaging and fuel. In term of employment, a total of permanent workers and non-permanent workers involved are 114 000 and 24 000 respectively with an average income of RM1200/worker/month. 96% of companies involved in domestic trade are small companies employing less than five workers. Supply chain system was dominated by a number of areas such as Klang Valley, Ipoh, Penang, Muar and Batu Pahat.

The study found that the official data relating to domestic trade of timber products and the data collected through surveys are not consistent. It is not because of illegal activities in the sector, but due to lack of statistics. Besides, statistical data collection procedures did not monitor the domestic trade of timber as a whole. This project presents the methodology that can be used to monitor and assess the domestic trade of timber and timber products on a continuous basis.



Proses kemasukan data oleh enumerator  
Data entry process by enumerators

## PENGURUSAN PENYELIDIKAN DAN PEMBANGUNAN MANAGEMENT OF RESEARCH AND DEVELOPMENT

Peruntukan R&D FRIM bagi tahun 2010 ialah sebanyak RM31.1 juta. Peruntukan berjumlah RM2.8 juta diterima daripada dana ScienceFund daripada Kementerian Pertanian dan Industri Asas Tani (MOA RM2.5 juta) dan Kementerian Sains, Teknologi dan Inovasi (MOSTI RM271 900). FRIM berjaya memperoleh dana berjumlah RM2.7 juta bagi dua projek penyelidikan daripada Tabung Pembangunan Industri Kayu-Kayan Malaysia (TPIKM) di bawah Kementerian Perlindungan dan Perusahaan Komoditi (KPPK).

FRIM telah mengendalikan sebanyak lima mesyuarat Jawatankuasa Penilai Institut (JPI) pada 2010 (19 Januari, 24 Februari, 30 Mac, 26 April dan 24-26 Mei) untuk menilai dan menyaring cadangan-cadangan penyelidikan sebelum menghantarnya kepada pelbagai agensi penaja.

Bengkel Penilaian dan Pemantauan Projek (PEM) dianjurkan dua kali setahun bertujuan untuk memantau dan menilai kemajuan projek-projek penyelidikan, termasuk projek kerjasama penyelidikan (MoU/Perjanjian) di FRIM. Selain itu seminar dianjurkan sebagai saluran untuk para penyelidik membentangkan hasil penyelidikan dan mendapat maklum balas daripada rakan penyelidik. PEM yang pertama tahun 2010 telah diadakan pada 13 & 14 April (sesi seminar dan viva). Bengkel PEM yang kedua diadakan pada 22–24 November. Mulai tahun 2010, sesi viva untuk projek kerjasama penyelidikan telah dijalankan. Tarikh sesi vivanya diadakan pada 16 Ogos pada 29 November.

Bengkel Permohonan Geran untuk ScienceFund MOA dijalankan pada 25 Februari melibatkan 19 orang pegawai penyelidik FRIM. Dua belas pegawai penyelidik telah mengikuti Bengkel Permohonan Geran bagi kali kedua yang diadakan serentak dengan Bengkel Pengurusan Data Penyelidikan pada 3 dan 4 Ogos. Bengkel Penulisan Dokumen Cadangan Penyelidikan dilaksanakan pada 21 dan 22 Disember. Tujuan bengkel-bengkel ini diadakan adalah untuk meningkatkan kemampuan pegawai penyelidik dalam penyediaan dokumen cadangan penyelidikan, penghantaran permohonan dalam talian, dan kaedah memuat naik dan mengemas kini data-data penyelidikan ke dalam sistem pengurusan maklumat penyelidikan (RIMS—*Research Information Management System*).

The R&D allocation for FRIM in 2010 was RM31.1 million. During the year, FRIM received RM2.8 million for ScienceFund from the Ministry of Agriculture and Agro-based Industry (MOA RM2.5 million) and Ministry of Science, Technology and Innovation (MOSTI RM271 900). Under a government fund called the Malaysian Timber Industries Development Fund or *Tabung Pembangunan Industri Kayu-Kayan Malaysia* (TPIKM), FRIM managed to secure with a total of RM2.7 million for two projects.

FRIM organized five Institute's Evaluation Committee meetings in 2010 (i.e., on 19 January, 24 February, 30 March, 26 April, and 24–26 May) to evaluate and screen research proposals by FRIM researchers before submitting them to various funding agencies.

Project Evaluation and Monitoring (PEM) is organized by the Research Planning and Corporate Division twice yearly to evaluate the progress of research projects, including collaborative projects (MoU/Agreement). Other than the viva, seminar is held for researchers to present their research findings and getting feedback from their colleague. The first PEM workshop was conducted on 13–14 April (seminar and viva sessions). The second PEM workshop was held from 22–24 November at FRIM. Starting 2010, selected research collaboration projects were also evaluated and monitored via viva session. This was held on 16 August and 29 November.

A workshop on MOA ScienceFund research grant application was held on 25 February for 19 FRIM research officers. Twelve research officers attended a second workshop held together with the workshop on research data management on 3 and 4 August. A workshop on proposal writing was held on 21 and 22 December. The objective of the workshop is to enhance the ability of researchers in the preparation of research proposal, submission of research grant application online, and procedures to upload and updating research data to RIMS, FRIM's Research Information Management System.

**Dana yang Diluluskan pada 2010 (KPPK, MOSTI dan MOA)**  
**Funds Approved in 2010 (KPPK, MOSTI and MOA)**

BIL. NO.	TAJUK PROJEK PROJECT TITLE	KETUA PROJEK PROJECT LEADER	DANA FUND (RM)	PENAJA FUNDING AGENCY
1	Penggunaan kayu sambungan jejari/laminasi untuk kerangka pintu yang dipasang bersama pintu rintangan api	Dr Gan Kee Seng	1,313,550	KPPK
2	Projek ketahanan kayu Malaysia berdasarkan keperluan standard Eropah EN 350 1:1994	Dr Rahim Sudin	1,400,000	
<b>JUMLAH/TOTAL</b>			<b>2,713,550</b>	
1	Effect of exotic and indigenous tree stands on soil properties, microclimate and woody plant diversity of an ex-tin mine	Dr Ang Lai Hoe	271,900	MOSTI
<b>JUMLAH/TOTAL</b>			<b>271,900</b>	
1	Evaluation of polysaccharide fraction from the fruits of <i>Averhoa Carambola</i> and its potential as cholesterol reducing agents	Zunoliza Abdullah	244,400	MOA
2	Repellency, biocidal and resistance studies of extracts and essential oils of <i>Clausena excavate</i> (cemumar) and <i>Zanthoxyllum acanthopodium</i> (hantu duri) againts <i>Aedes aegypti</i> and <i>Culex quinquefasciatus</i>	Zaridah Mohd Zaki	213,600	
3	Development of tropical herbal products from selected <i>Alpinia</i> species	Mailina Jamil	190,000	
4	Development of aromatherapy pellets and briquette from agriculture and wood residues	Puad Elham	215,160	
5	Biopotential and bioefficacy evaluation of <i>Ocimum sanctum</i> Linn. towards nutraceutical product development	Dr Vimala Subramaniam	250,000	
6	Payment to ecosystem services: valuation of watershed services of tropical forest	Dr Ismariah Ahmad	178,000	
7	The soil carbon sequestration potential along elevational gradients of tropical forest reserves in Raub/Cameron Highland, Pahang	V.Jeyanny Vijayanathan	96,000	
8	Identification of an effective method to induce flowering of <i>Xanthostemon chrysanthus</i> (jambu kuning) as a landscape tree	Ahmad Nazaruddin Mohd Roseli	77,000	
9	Development of highly polymorphic microsattelite DNA markers for cultivar identity testing and germplasm evaluation of four important medicinal plants in Malaysia	Dr Tnah Lee Hong	150,000	
10	Species identification of woods of common Malaysian commercial timbers using DNA barcodes	Dr Lee Soon Leong	160,000	
11	Development of a DNA-based tracking system in <i>Koompassia malaccensis</i> timber for forestry forensic application	Dr Lee Chai Ting	95,000	
12	Resources assessment and productivity enhancement of <i>Dendrocalamus asper</i> (buluh betung) and <i>Gigantochloa albociliata</i> (buluh madu) for shoot production	Abd Razak Othman	126,000	
13	DNA-based timber tracking and genetic conservation of <i>Shorea platyclados</i> (Meranti Bukit) in Peninsular Malaysia	Dr Ng Chin Hong	90,000	
14	Polyploid induction in selected foxtail, mecklace and slipper orchids: towards the development of improved breeding stock	Dr Norwati Mohammad	116,500	
15	Impact of changes on forest structure due to timber harvesting on insectivorous bat assemblages as a representative of forest biodiversity	Dr Serafina Christine Fletcher	116,500	
16	Design of fungi biosensor for insecticide permethrin detection in treated wood	Mohamad Nasir Mat Arip	128,000	
17	Development of microsatellite markers for <i>Begonias</i> of Peninsular Malaysia for population genetic studies	Chan Yoke Mui	80,000	
<b>JUMLAH/TOTAL</b>			<b>2,526,160</b>	
<b>JUMLAH BESAR/ GRAND TOTAL</b>			<b>5,511,610</b>	

## PEMINDAHAN TEKNOLOGI TECHNOLOGY TRANSFER

FRIM terus meningkatkan usaha dalam pemindahan teknologi. Selaras dengan objektif institut, maklumat tentang pengurusan dan pembangunan perhutanan, hasil hutan dan penggunaannya terus disebar kepada pelanggan melalui kursus, seminar, bengkel, persidangan, simposium dan pameran. Aktiviti pemindahan teknologi ini dianjurkan oleh FRIM ataupun anjuran secara kerjasama dengan agensi lain termasuklah organisasi di dalam dan di luar negara.

FRIM continues to step up 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 utilization was disseminated through training courses, seminars, workshops, conferences, symposia and exhibitions. Many of these activities were either organized solely by FRIM or jointly with other collaborative agencies—national and international organizations.

### SEMINAR/BENGGEL/PERSIDANGAN/KURSUS/DIALOG/FORUM SEMINARS/WORKSHOPS/CONFERENCES/COURSES /DIALOGUES/FORA

BIL. NO.	TAJUK TITLE	TARIKH DATE
1	Training on the Use of GER Spectroradiometer in Forestry	19–20 Januari/January
2	Bengkel Pendokumentasian & Pengutipan Sampel Tumbuhan Ubatan & Aromatik Orang Asli Semelai di RPS Iskandar, Bera, Pahang. Fasa 2	2–4 Februari/February
3	Trimble RTK GPS and Post Process Training	3–5 Februari/February
4	Latihan Dalaman bagi Penentuan Biojisim Anak Pokok Chengal di Nurseri	6–7 Februari/February
5	Kursus Inventori Hutan	8–9 Februari/February
6	Bengkel Pendokumentasian Spesies Tumbuhan Ubatan di Tasik Bera, Pahang, Fasa 2	8–10 Februari/February
7	Basic Jungle Survival	23–24 Februari/February
8	Course on Pulp and Paper Technology for SPPT Engineering Sdn Bhd	1– 4 Mac/March
9	Stakeholder Analysis on Traditional Knowledge	17 Mac/March
10	Seminar ITTO	23–25 Mac/March
11	Flora of Peninsular Malaysia and Flora of Malaysia Seminar	30 Mac/March
12	Kursus Impulse dan Pemetaan Pokok	7–8 April
13	Kursus Pengenalan Pokok dan Daun	19–23 April
14	Training on Biomass & Carbon Stock Inventory Using Remote Sensing Methods	20–23 April
15	Kursus Landskap I	26–30 April
16	Tree Identification Course	19–26 April
17	Penanaman Bakau Teknik Inovatif (Comp-mat dan Comp-pillow)	25–26 Mei/May
18	Course on Wood Drying (FRIM-MTIB-UPM)	3–21 Mei/May
19	Bengkel Pendokumentasian & Pengutipan Sampel Tumbuhan Ubatan & Aromatik Orang Asli Jahai & Temiar di RPS Banun, Gerik, Perak (Fasa 1)	4–6 Mei/May
20	Bengkel Pendokumentasian & Pengutipan Sampel Tumbuhan Ubatan & Aromatik Orang Asli Jahai & Temiar di RPS Banun, Gerik, Perak (Fasa 2)	13–16 Julai/July
21	Bengkel Pendokumentasian Spesies Tumbuhan Ubatan di Ayer Banun, Perak. Fasa 2	13–16 Julai/July
22	Seminar MyERNet: The Second Analytical Workshop on Dynamic Plot Database Application and Design Tool	18–24 Julai/July
23	Regional Training Workshop on Mangrove Mangement and Restoration Techniques	26–29 Julai/July
24	Latihan Pengendalian Peralatan dan Pengutipan Data Kualiti Air	27–29 Julai/July
25	Training Course on Identification and Taxonomy of South East Asian Fireflies	27– 31 Julai/July
26	2nd International Firefly Symposium (IFS)	2–5 Ogos/August
27	Seminar Projek-Projek Penyelidikan FRIM ke Arah Pengurusan Hutan Secara Berkekalan	3–5 Ogos/August
28	12th Medicinal and Aromatic Plants Seminar 2010	3–4 Ogos/August
29	Talk on Heat Treatment of Wood Packaging Material	30 September

30	Seminar Bakau Kebangsaan 2010	5–6 Oktober/October
31	International Symposium on Forestry and Forest Products 2010 (ISFPP)	5–7 Oktober/October
32	Kursus Landskap II	18–22 Oktober/October
33	Latihan Asas Pemprosesan Data Hyperspektra bagi Pemetaan Pokok Ramin	26–27 Oktober/October
34	Bengkel Analisis Stakeholder Pengetahuan Tradisi (TK) Orang Asli	27 Oktober/ October
35	Conference on Best of Both Worlds 2010: “Environmental Education for Sustainable Development”	8–10 November
36	Symposium on 25 Years of Research at Pasoh 50-Ha Long Term Ecological Plot	10–14 November
37	Regional Workshop on Activities Implementation and Monitoring of the ITTO-CITES Programme in Malaysia	1–4 Disember/December
38	Seminar Kebangsaan Pengetahuan Tradisi berkaitan Biodiversiti di Malaysia: Perkongsian Pintar antara Pembuat Polisi, Agensi Pelaksana & Komuniti	2 Disember/December
39	ITTO-CITES Workshop on Ramin	3–5 Disember/December
40	Forum on Forest Products R&D (with stakeholders)	15 Disember /December
41	Kursus Pengecaman Spesies Paya Laut	20–22 Disember/December

### **Bengkel “The Second Analytical Workshop on Dynamic Plot Database Application and Tool Design”**

FRIM telah melancarkan penubuhan pasukan MyERNet (Malaysian Ecological Research Network) di bawah Bahagian Perhutanan untuk mempertingkatkan lagi usaha mendokumentasikan rekod dan data kajian di FRIM dengan menggunakan perisian *open-source* MORPHO dan METACAT. Usaha ini diwujudkan supaya semua maklumat kajian penyelidikan dapat disimpan dan digunakan sebagai rujukan para saintis sekarang dan akan datang. Usaha juga telah dijalankan untuk menyediakan satu platform untuk para saintis menganalisis data dan menjalan perbandingan hasil analisis dari pelbagai tapak kajian secara dalam talian. Beberapa siri latihan telah dijalankan untuk memperkenalkan sistem pengurusan maklumat ini. Pada tahun lepas pasukan MyERNet dengan kerjasama rakan sejawat dari pasukan pengurusan maklumat kajian ekologi jangka panjang (LTER) bagi rantau Asia Pasifik Timur menganjurkan satu bengkel bertajuk “*The Second Analytical Workshop on Dynamic Plot Database Application and Tool Design*” di FRIM bermula dari 19–23 Julai. Bengkel ini ialah lanjutan daripada bengkel pertama yang diadakan di Taiwan pada Jun 2009.

Objektif utama bengkel ini adalah untuk membantu memperkukuh pembangunan sistem pengurusan dan analisis data yang lebih cekap dan berkesan, dan mempromosi penggunaan sistem tersebut kepada agensi-agensi di dalam dan di luar negara. Bengkel ini telah dihadiri oleh peserta dari dalam dan luar negara di rantau Asia Pasifik. Beberapa orang pakar pengurusan maklumat dari Amerika Syarikat, Taiwan, Puerto Rico turut mengambil bahagian. Seramai 25 orang peserta telah menyertai bengkel ini. Kajian perbandingan diversiti tumbuhan berasaskan maklumat bancian plot dinamika jangka panjang dari pelbagai kawasan termasuk Malaysia, Taiwan, Vietnam, Singapura, Puerto Rico telah digunakan. Pembangunan alat untuk kajian ini sedang diteruskan dan apabila siap nanti dijangka boleh digunakan untuk kajian perbandingan diversiti dari pelbagai tapak secara talian terus melalui internet.

### **The Second Analytical Workshop on Dynamic Plot Database Application and Tool Design**

FRIM launched the establishment of MyERNet (Malaysian Ecological Research Network) team under the Forestry and Environment Division with the aim to improve management of research information using open-source MORPHO and METACAT software. The initiative was aimed to ensure that all important research information can be kept and referred to by current and future scientists. A series of training sessions were organized by MyERNet team for FRIM and other relevant agencies. Last year MyERNet team together with its counterpart from the information management team of the Long-Term Ecological Research of the East Asia Pacific organized a workshop entitled *The Second Analytical Workshop on Dynamic Plot Database Application and Tool Design* at FRIM from 19 to 23 July. The workshop was the second series of the earlier workshop organized in Taiwan in June 2009.

The main objective of the workshop was to strengthen the development of the information management and data analysis system, improving its efficiency and effectiveness, and to promote its application to local agencies as well as outside the country in the region. Twenty-five participants of the workshop came from the local and East Asia Pacific region. Several experts on information management from the USA, Taiwan and Puerto Rico also participated in the workshop. Besides the promotion of the information management system, a group of the experts developed an analytical tool for the comparative analysis of tree diversity from long-term demography plots in several sites including Malaysia, Taiwan, Vietnam, Singapore and Puerto Rico. The analytical tool allows scientists to run comparative analysis through the internet.

## Simposium Antarabangsa Kelip-Kelip Kedua

FRIM dan Persatuan Pencinta Alam (MNS) telah menganjurkan Simposium Antarabangsa Kelip-kelip Kedua di Selangor pada 2–5 Ogos. Penganjuran simposium bertaraf antarabangsa ini telah meletakkan Malaysia di peta dunia sebagai pusat penyelidikan dan pemuliharaan kelip-kelip. Simposium ini dianjurkan bersempena dengan Tahun Biodiversiti Antarabangsa, ulang tahun ke-25 penubuhan FRIM dan ulang tahun ke-70 MNS. Acara ini telah dirasmikan oleh Ketua Pengarah FRIM, Dato' Dr Abd Latif Mohmod, mewakili Dato' Zool Azha Yusof, Ketua Setiausaha NRE. Penganjuran simposium ini turut mendapat sokongan daripada Kerajaan Negeri Selangor, Lembaga Urus Air Selangor (LUAS), Pelancongan Negeri Selangor, Kementerian Pelancongan Malaysia, Tenaga Nasional Berhad (TNB) dan Malakoff.

Seramai 74 peserta dari 13 buah negara menghadiri simposium tersebut untuk berkongsi maklumat penemuan terbaharu penyelidikan kelip-kelip di samping mengukuhkan lagi jaringan kerjasama antarabangsa. Tema yang dipilih untuk simposium ini ialah "Pemuliharaan Kelip-kelip: Daripada Penyelidikan kepada Pelaksanaan". Semasa simposium berlangsung, sebanyak 26 kertas kerja telah dibentangkan dan 11 poster dipaparkan meliputi aspek biodiversiti, taksonomi, filogeni, biologi, perlakuan, ekologi dan pemuliharaan kelip-kelip, termasuk ekopelancongan kelip-kelip. Ini termasuklah ucpatama yang merungkai isu taksonomi kelip-kelip di rantau ini dan rehabilitasi habitat kelip-kelip. Penganjuran simposium ini juga telah membuka ruang kepada penyelidik-penyelidik FRIM untuk mengetengahkan penyelidikan yang dilaksanakan dalam bidang ekologi dan konservasi kelip-kelip di Malaysia menerusi pembentangan tiga kertas kerja dan dua poster meliputi kajian habitat larva kelip-kelip di Sungai Selangor, kaedah baharu pemantauan kelip-kelip dan keputusan tiga tahun pemantauan menggunakan kaedah yang dibangunkan.

Pada hari terakhir penganjuran, satu perisytiharan telah dibuat semasa berlangsungnya Mesyuarat Jaringan Penyelidikan Kelip-kelip Antarabangsa Ketiga. Perisytiharan yang dikenali sebagai "Perisytiharan Selangor: Pemuliharaan Kelip-kelip" antara lain mengetengahkan kepentingan usaha-usaha untuk lebih memahami kelip-kelip dari segi taksonomi, biodiversiti dan perlakuan, dengan tujuan utama untuk

## The Second International Firefly Symposium

The *Second International Firefly Symposium*, organized by the Forest Research Institute Malaysia (FRIM) and Malaysian Nature Society (MNS) in Selangor from 2 to 5 August, put Malaysia on the map as a centre of research and conservation for fireflies. It was held in conjunction with the International Year for Biodiversity, the 25th anniversary of FRIM and the 70th anniversary of MNS. The symposium was officiated by the Director General of FRIM, Dato' Dr Abd Latif Mohmod on behalf of Dato' Zool Azha Yusof, Secretary General of the NRE and was supported by the Selangor State Government, Selangor Waters Management Authority (LUAS), Tourism Selangor, Ministry of Tourism Malaysia, Tenaga Nasional Berhad (TNB) and Malakoff.

The symposium was attended by 74 participants from 13 countries, who shared the latest research findings on fireflies as well as strengthened international networking. The theme of the symposium was "Firefly Conservation: From Science to Practice." A total of 26 oral papers and 11 posters were presented on the diversity, taxonomy, phylogeny, biology, behaviour, ecology and conservation of fireflies, as well as on their importance to ecotourism. These included keynote addresses on problems facing the taxonomy of fireflies in the region and restoration of firefly habitats. The symposium also provided the opportunity for FRIM researchers to showcase local research on the ecology and conservation of fireflies in Malaysia, with three papers and two posters presented on topics such as the habitat of firefly larvae along the Selangor River, a novel technique of monitoring fireflies and the results of three years of monitoring.

During the final day of the symposium, a declaration was made at the Third International Firefly Research Network Meeting. The declaration is known as *The Selangor Declaration: Conservation of Fireflies*. The declaration advocates the importance of understanding firefly taxonomy, biodiversity and behaviour as a basis for conservation efforts, besides stressing the role that governments, local authorities, agencies and corporations can play in helping to conserve fireflies and promote awareness. It has been disseminated to government authorities and agencies.



Dr Lesley Ballantyne menunjuk ajar para peserta Kursus Latihan Pengelasan dan Taksonomi Kelip-Kelip di Asia Tenggara  
Dr Lesley Ballantyne teaching participants of the Training Course on the identification and taxonomy of South-east Asian Fireflies

memulihara serangga istimewa ini. Selain itu perisytiharan ini mengetengahkan peranan yang boleh diambil oleh kerajaan, pihak berkuasa tempatan, agensi dan badan korporat dalam memulihara kelip-kelip dan meningkatkan kesedaran umum. Perisytiharan ini telah diedarkan kepada pihak berkuasa dan agensi-agensi kerajaan.

Bersempena dengan penganjuran simposium ini, Kursus Pengecaman dan Taksonomi Kelip-kelip Asia Tenggara telah dijalankan di FRIM pada 27–31 Julai. Kursus lima hari tersebut dikendalikan oleh dua pakar taksonomi dari Australia dan Taiwan. Antara topik yang didedahkan kepada peserta adalah seperti kaedah persampelan di lapangan dan pengawetan, taksonomi dan klasifikasi kelip-kelip dan amali kaedah pengecaman. Kursus ini berjaya melatih 20 orang peserta dari Malaysia, Thailand, Singapura, Sri Lanka, Hong Kong dan Amerika Syarikat.

### Seminar Tumbuhan Ubatan dan Beraroma

Seminar Tumbuhan Ubatan dan Beraroma 2010 yang bertemakan “Memanfaatkan Warisan Herba Tropika: Kemajuan Terkini dalam Penyelidikan, Pembangunan dan Komersialisasi” diadakan dengan jayanya pada 3–4 Ogos di FRIM. Seminar ini dirasmikan oleh YB Tan Sri Joseph Kurup, Timbalan Menteri NRE. Majlis Pelancaran produk “Yaqin”, usahasama FRIM dan Abadi Industri Sdn Bhd telah diadakan semasa majlis perasmian tersebut. Seminar ini telah menarik seramai 167 peserta dan sejumlah 76 kertas kerja (sebelas penceramah jemputan, 14 pembentangan lisan dan 51 pembentangan poster) telah dibentangkan semasa seminar. Ucaptama telah disampaikan oleh Prof Emeritus Dr Mohd Ismail Tambi manakala Prof Koh Hwee Ling (National University of Singapore) dijemput sebagai penceramah jemputan luar negara. Di samping itu, Seminar ini berjaya menarik sebanyak lapan penyertaan pameran oleh agensi swasta dan kerajaan.



Tan Sri Joseph Kurup sedang merasmikan MAPs 2010  
Tan Sri Joseph Kurup is launching the MAPs 2010

In conjunction with the symposium, a *Training Course on Identification and Taxonomy of Southeast Asian Fireflies* was conducted in FRIM from 27 to 31 July. The five-day course was facilitated by two firefly taxonomists from Australia and Taiwan. The course covered a wide range of topics such as methods of field collection and preservation, taxonomy and classification of fireflies and practical methods of identification. The course successfully trained 20 participants from Malaysia, Thailand, Singapore, Sri Lanka, Hong Kong and the United States of America.

### Medicinal and Aromatic Plants Seminar (MAPs)

The Medicinal and Aromatic Plants Seminar (MAPs) 2010 themed “Harnessing the Tropical Herbal Heritage: Recent Advances in R&D and Commercialization” was successfully held on 3–4 August at FRIM. It was officiated by YB Tan Sri Joseph Kurup, Deputy Minister of NRE. Launching of product *Yaqin*, a collaboration between FRIM and Abadi Industries Sdn Bhd, was held during the opening ceremony. The seminar attracted 167 participants and 76 papers (11 invited papers, 14 oral and 51 poster presentations) were delivered during the seminar. The keynote address was delivered by Prof Emeritus Dr Mohd Ismail Tambi, and Prof Koh Hwee Ling (National University of Singapore) was invited as the international speaker. There were also eight booths set up by exhibitors from various private companies and government agencies.



Majlis pelancaran produk “Yaqin”  
Launching ceremony of *Yaqin* product

## Simposium Antarabangsa Perhutanan dan Hasil Hutan 2010 (ISFFP)

FRIM berkongsi pelbagai maklumat berkenaan inovasi dan penemuan termasuk perkhidmatan yang ditawarkan sebagai sokongan kepada industri kayu-kayan Malaysia di Simposium Antarabangsa Perhutanan dan Hasil Hutan 2010 (ISFFP) yang berlangsung di Kuala Lumpur baru-baru ini.

Lebih daripada 80 pembentangan secara lisan—lebih separuh merupakan pembentangan oleh para penyelidik FRIM di bawah empat tema utama iaitu Perhutanan, Kepelbagaian Biologi dan Hutan Ladang; Produk Hutan dan Sosio-ekonomi; Bioteknologi; dan Perubahan Iklim.

Majlis pembukaan simposium ini telah dirasmikan oleh Timbalan Menteri NRE, Tan Sri Datuk Sri Panglima Joseph Kurup, bagi pihak Menteri, Dato Seri Douglas Uggah Embas, pada 5 Oktober.

Sempena Simposium ini, dua buah buku keluaran FRIM yang bertajuk, “Timber Features at FRIM” dan “Flora of Peninsular Malaysia: Series II, Seed Plants” turut dilancarkan.

Simposium ini dihadiri oleh 350 peserta dari dalam dan luar negara termasuk Thailand, Singapura, Turki, Jepun dan India. Mereka terdiri daripada penyelidik, penggiat industri, pembuat polisi, pengurus hutan dan wakil-wakil badan bukan kerajaan.

## International Symposium on Forestry and Forest Products 2010 (ISFFP)

FRIM shared its knowledge, innovations, findings and services in support of various industries, at the *International Symposium of Forestry and Forest Products 2010 (ISFFP)* held in Kuala Lumpur recently.

There were over 80 oral presentations, of which more than half were by FRIM researchers, under four major themes, namely Forestry, Biodiversity and Forest Plantations; Forest Products and Social-Economy; Biotechnology; and Climate Change.

The opening of the symposium was officiated by the Deputy Minister of NRE, Tan Sri Datuk Sri Panglima Joseph Kurup, on behalf of the Minister, Dato Sri Douglas Uggah Embas, on 5 October.

In conjunction with the event, two books produced by FRIM entitled, “Timber Features at FRIM” and “Flora of Peninsular Malaysia: Series II, Seed Plants” were also launched.

The symposium was attended by 350 local and foreign participants from various countries such as Thailand, Singapore, Turkey, Japan and India. They included researchers, entrepreneurs, policy-makers, forest managers, as well as representatives from non-governmental organizations.



Tan Sri Joseph dan Dato' Dr Abd Latiff menunjukkan kedua-dua buah buku yang dilancarkan semasa seminar  
Tan Sri Joseph and Dato' Dr Abd Latiff showing the two books launched during the seminar

## **Persidangan *Best of Both Worlds 2010: Effective Environmental Education for Biodiversity Conservation***

Seminar *Best of Both Worlds 2010* (BoBW 2010) telah dianjurkan oleh Program Ekopelancongan dan Hutan Bandar, FRIM pada 8–10 November di Kuching, Sarawak. Sama Jaya Nature Reserve telah dijadikan lokasi untuk menjalankan praktikal aktiviti pendidikan alam sekitar. Seminar ini ialah anjuran bersama *Sarawak Forestry Corporation* dengan sokongan NRE, Kementerian Pelajaran Malaysia, Biro Konvensyen Sarawak dan Dewan Bandaraya Kuching Utara. Seminar berkenaan disertai oleh 96 peserta yang terdiri daripada 85 peserta dari Malaysia dan sebelas orang peserta dari luar negara iaitu Afrika Selatan, United Kingdom, Singapura, Thailand dan Indonesia.

BoBW 2010 bertujuan untuk mengetengahkan kepentingan bidang pendidikan alam sekitar dalam usaha konservasi sumber biodiversiti serta membincangkan kemajuan pelaksanaan pendidikan alam sekitar. Di samping itu, seminar ini berperanan sebagai ruang perkongsian pengalaman dan pengetahuan para penggiat pendidikan alam sekitar dalam mempraktikkan pendidikan alam sekitar kepada kumpulan sasaran.

Di samping dua ucapan utama yang disampaikan oleh pembentang dari *Universiti South Africa* dan *Universiti Edinburgh*, United Kingdom, 16 kertas kerja dan lapan poster telah dibentangkan yang meliputi tema-tema berikut: i) Pendidikan konservasi flora dan fauna, ii) Pendidikan alam sekitar untuk kelestarian cara hidup, iii) Kaedah pelaksanaan program pendidikan alam sekitar yang efektif, dan iv) Penilaian program pendidikan alam sekitar.

Seminar berkenaan menyediakan jaringan kerjasama antara agensi-agensi kerajaan, badan bukan kerajaan dan institusi dari luar negara dalam menjalankan program-program pendidikan alam sekitar. Sebagai kesimpulan umum daripada kertas kerja yang telah dibentangkan, bengkel interaktif yang dijalankan serta lawatan seminar ke Semenggoh Nature Reserve, kaedah seperti interpretasi persekitaran, polisi, panduan, jaringan kerjasama atau pengalaman boleh diguna pakai dan menyokong pelaksanaan pendidikan alam sekitar yang efektif. Pendidikan alam sekitar juga wajar dilaksanakan di setiap peringkat komuniti dan memerlukan sokongan pelbagai agensi termasuk badan bukan kerajaan. Juga didapati secara umumnya terdapat peningkatan aktiviti pendidikan alam sekitar diamalkan terutamanya di Kementerian Pelajaran Malaysia.

## **Simposium Antarabangsa Pasoh dan Hari Terbuka Pasoh**

Ulang tahun ke-25 penyelidikan hutan pamah tropika di petak kekal Pasoh 50 ha adalah seiring dengan sambutan Ulang Tahun FRIM ke-25, maka simposium bertaraf antarabangsa bertajuk “Pasoh International Symposium: Celebrating 25 Years of Lowland Tropical Forest Research” telah diadakan pada 10–11 November di FRIM. Sambutan ini dianjurkan secara bersama oleh FRIM, Jabatan Perhutanan Negeri Sembilan, *Centre for Tropical Forest Sciences* (CTFS) dengan sokongan NRE. Objektif utama simposium ini adalah untuk mengumpul para penyelidik dalam bidang ekologi untuk

## **Best of Both Worlds Conference 2010: Effective Environmental Education for Biodiversity Conservation**

The *Best of Both Worlds Conference 2010* (BoBW 2010) was organized by FRIM from 8 to 10 November in Kuching, Sarawak. Hands-on activities of environmental education were conducted at the Sama Jaya Nature Reserve. The conference was co-organized with the Sarawak Forestry Corporation with support from the NRE Ministry of Education, Sarawak Convention Bureau and the Commission of the City of Kuching North. The successful event saw 96 participants with 85 participants from Malaysia and 11 international participants from South Africa, United Kingdom, Singapore, Thailand and Indonesia.

The aim of the *BoBW* was to highlight the importance of environmental education in biodiversity conservation, to discuss the progress in environmental education and to serve as a platform for the practitioners of environmental education to share examples and lessons learned in environmental education.

Apart from the two keynote addresses by prominent speakers from the University of South Africa and University of Edinburgh, United Kingdom, a total of 16 oral papers and eight posters were presented in the conference which covered the following themes: i) Conservation Education on Flora and Fauna, ii) Environmental Education for Sustainable Lifestyle, iii) Methods for Effective Environmental Education Programmes, and iv) Evaluation on Environmental Education Programmes.

The conference provided a networking establishment between government and non-government agencies, and international institutions for the implementation of environmental education programmes. From the papers presented, interactive workshops and post-tour visit to Semenggoh Nature Reserve, it was concluded that methods or tools such as environmental interpretation, policy, guidelines, networking or experiences can be utilized to support the implementation of effective environmental education. Environmental education should also be implemented at every level of community and needs support from different agencies including non-government agencies. It was also found that in general there was an increase of environmental education practices especially within the Ministry of Education Malaysia.

## **Pasoh International Symposium and Open Day 2010**

An international symposium was held to commemorate the 25th Anniversary of the Pasoh 50-ha Plot and also in conjunction with the 25th Anniversary of FRIM. The *Pasoh International Symposium: Celebrating 25 Years of Lowland Tropical Forest Research* was held on 10–11 November at FRIM. The celebration was jointly organized by FRIM, the Negeri Sembilan State Forestry Department and Centre for Tropical Forest Sciences (CTFS, USA), with the support from NRE. The main objective of the symposium was to share the research findings of scientists which have made a mark in Pasoh these past 25 years and also to pave the road for research and development in Pasoh according to the country's aspirations and needs. It was also hoped that the symposium

berkongsi maklumat, membina jaringan ilmu serta mencarta hala tuju R&D di Pasoh supaya selaras dengan hasrat dan keperluan negara. Secara tidak langsung, simposium ini dapat mempromosi SPF Pasoh sebagai tapak kajian ekologi dan tarikan ekopendidikan.

Simposium bertaraf antarabangsa ini telah dirasmikan oleh Datuk Azyiah Mohamed selaku Timbalan Ketua Setiausaha I NRE. Seramai 80 peserta dari Amerika Syarikat, Jepun, Taiwan, Cameroon, Papua New Guinea, Thailand, China, Singapura, Brunei dan Malaysia telah menghadiri upacara perasmian tersebut. Ucaptama telah disampaikan oleh mantan Ketua Pengarah FRIM, Tan Sri Dato' Dr Salleh Mohd Nor. Simposium yang berlangsung selama dua hari itu telah menyaksikan pembentangan 16 kertas menerusi empat sesi: 1) *Collaborative Research*, 2) *Population dynamics and forest modeling*, 3) *Biodiversity*, dan 4) *Climate Change and The Forest*. Antara pembentang ialah Dr Stuart Davies dari CTFS, Prof Dr Okuda dari NIES, Dato' Dr Abdul Rashid Malik dari FRIM dan Dr Patrick Jansen dari TEAM. Simposium itu diakhiri dengan sesi perbincangan panel. Ahli panel yang dijemput mewakili pihak-pihak berkepentingan terhadap masa depan penyelidikan Hutan Simpan Pasoh; Tuan Hj Roslan Ariffin iaitu Pengarah Jabatan Perhutanan Negeri Sembilan, Dato' Dr Abdul Rashid Abd. Malik selaku Timbalan Ketua Pengarah FRIM (Penyelidikan) dan Pengerusi Jawatankuasa Penyelidikan Pasoh FRIM, Dr Stuart Davies iaitu Pengarah *Centre for Tropical Forest Sciences* (CTFS), dan Dato' Prof Dr Abdul Latif Mohammad dari Universiti Kebangsaan Malaysia (UKM).

Simposium tersebut diikuti dengan sambutan Hari Terbuka Pasoh pada 12–14 November di Stesen Penyelidikan FRIM (SPF) Pasoh, Negeri Sembilan. Upacara perasmian Hari terbuka Pasoh dikendalikan oleh jawatankuasa yang dipengerusikan oleh Jabatan Perhutanan Negeri Sembilan dan terdiri daripada agensi-agensi tempatan Negeri Sembilan. Hari terbuka ini yang dirasmikan oleh Dato' Razak Mansor, Yang DiPertua Dewan Undangan Negeri, Negeri Sembilan.

would help promote Pasoh as a research site for ecological studies and as an eco-education centre.

This internationally acclaimed symposium was officiated by Datuk Azyiah Mohamed, Deputy Secretary General I of the NRE. It was attended by 80 participants from the United States of America, Japan, Taiwan, Cameroon, Papua New Guinea, Thailand, China, Singapore, Brunei and Malaysia. The keynote address was delivered by none other than the former Director General of FRIM, Tan Sri Dato' Dr Salleh Mohd Nor. The symposium which lasted for two days, saw 16 presentations encompassing four sessions: 1) Collaborative Research, 2) Population Dynamics and Forest Modelling, 3) Biodiversity, and 4) Climate Change and the Forest. Among the speakers were Dr Stuart Davies from CTFS, Prof Dr Okuda from NIES, Dato' Dr Abdul Rashid Abd Malik from FRIM and Dr Patrick Jansen from TEAM. The symposium ended with a panel discussion on Pasoh's future represented by the important people, Tn Hj Roslan Ariffin, Director of Peninsular Malaysia Forestry Department, Dato' Dr Abdul Rashid Ab Malik, Deputy Director General (Research) in FRIM and also Chairman of Pasoh Research Committee, Dr Stuart Davies, Director of Centre for Tropical Forest Sciences (CTFS) and Dato' Prof Dr Abdul Latif Mohammad, University Kebangsaan Malaysia (UKM).

The symposium was then followed with an Open Day from 12 to 14 November at the Pasoh Research Station, Negeri Sembilan. The ceremony was officiated by Dato' Razak Mansor, Speaker of the Negeri Sembilan State Legislative Assembly, and was chaired by the Negeri Sembilan State Forestry Department and co-organized with a few local agencies. One hundred people attended the ceremony, including the symposium participants and representatives from the local agencies. The Pasoh Arboretum, which had been recently upgraded, was also opened with a tree planting ceremony. Among the activities that were lined up for the day were guided tours to the arboretum, nature trails, aluminum tower and briefing by the director of CTFS on his experiences



Ucapan perasmian oleh Datuk Azyiah  
Opening speech by Datuk Azyiah

Seramai 100 orang telah menghadiri upacara perasmian ini yang terdiri daripada peserta Simposium Pasoh dan agensi-agensi tempatan Negeri Sembilan. Arboretum Pasoh juga yang telah dirasmikan dengan acara penanaman pokok oleh dif-dif terhormat. Ia diikuti dengan lawatan berpandu ke Arboretum Pasoh, Denai Alam, menara aluminium dan taklimat oleh Pengarah CTFS mengenai pengalamannya sebagai ahli ekologi. Bagi memperkenalkan HS Pasoh dan aktiviti-aktiviti yang dijalankan di SPF Pasoh kepada orang awam, pelbagai acara menarik telah diadakan untuk pelajar-pelajar sekolah rendah dan menengah jempunan, serta orang awam. Seramai 80 orang penduduk dari kawasan berdekatan (FELDA Pasoh 1–4) telah menyertai acara-acara tersebut.

### **Seminar Kebangsaan Pengetahuan Tradisi Berkaitan Biodiversiti di Malaysia**

Dirasmikan oleh Menteri NRE, Dato Sri Douglas Uggah Embas, seminar kebangsaan pengetahuan tradisi (TK) tentang biodiversiti berjaya dianjurkan pada 2 Disember di FRIM.

Bertemakan “Perkongsiannya Pintar antara Pembuat Polisi, Agensi Pelaksana dan Komuniti”, seminar sehari yang dianjurkan bersama oleh NRE dan FRIM dengan sokongan Jabatan Hal Ehwal Orang Asli (JHEOA) dan Lestari, Universiti Kebangsaan Malaysia (UKM) berjaya mencapai objektifnya dalam perkongsiannya pengalaman mendokumentasi pengetahuan tradisi tentang tumbuhan ubatan dan beraroma yang digunakan oleh Orang Asli. Projek ini dimulakan oleh NRE dan dilaksanakan oleh FRIM di bawah Rancangan Malaysia Ke-9 (pertengahan 2007–2010).

Dihadiri oleh 158 orang peserta dari pelbagai agensi, termasuklah wakil-wakil dari badan-badan bukan kerajaan (NGO) dan 24 Orang Asli, seminar ini berjaya meningkatkan kerjasama di kalangan pihak-pihak berkepentingan, di samping berbincang tentang cabaran dan hala tuju di masa hadapan ke arah kesinambungan pengetahuan tradisi di peringkat kebangsaan. Seminar ini juga menyediakan peluang kepada pelbagai pihak berkepentingan untuk berinteraksi dan mengukuhkan jaringan mereka.

Ucuptama telah disampaikan oleh Prof Emeritus Dato’ Dr Hood Salleh dari UKM, seorang saintis terkenal yang banyak membuat kajian mengenai Orang Asli. Sesi pagi diisi dengan pembentangan oleh kumpulan penyelidik TK FRIM tentang pencapaian terkini dalam mendokumentasikan TK di bawah projek NRE. Pembentangan oleh pihak JHEOA, Pusat Biodiversiti Sarawak (SBC), Perbadanan Harta Intelek Malaysia (MYIPO) dan Universiti Darul Iman Terengganu menekankan tentang keperluan untuk terus mendokumentasi TK dalam Rancangan Malaysia ke-10 (2011–2015) sebelum TK kian terhakis dan pupus daripada subetnik Orang Asli.

Para peserta seminar juga berpeluang mendengar pembentangan oleh empat wakil subetnik Orang Asli iaitu mengenai perspektif dan pengalaman mereka yang terlibat dalam pendokumentasian PT, iaitu Jahai dan Temiar dari Banun, (Perak), Semelai dari Tasik Bera, Pahang dan orang Semai dari Ulu Groh, (Perak). Orang Asli turut mempamerkan tumbuhan ubatan dan beraroma yang mereka gunakan

as an ecologist. To introduce the Pasoh Forest Reserve and the activities done at the Research Station to school students and the general public, a variety of activities such as Explorace, Karaoke and family games were held. Around 80 people from FELDA Pasoh 1-4 joined in the activities.

### **National Seminar on Traditional Knowledge Related to Biodiversity in Malaysia**

Officiated by the Minister of NRE, Dato Sri Douglas Uggah Embas, the *National Seminar on Traditional Knowledge (TK) Related to Biodiversity* was successfully conducted at FRIM on 2 December.

With the theme “Smart partnership between policy-makers, project implementing agencies and communities,” the one-day seminar organized jointly by the NRE and FRIM with support from the Department of Orang Asli Affairs (JHEOA) and Lestari, Universiti Kebangsaan Malaysia (UKM), achieved its objectives in sharing experiences in documentation of TK on medicinal and aromatic plants used by the Orang Asli. The project was initiated by the NRE and implemented by FRIM under the Ninth Malaysia Plan (mid 2007–2010).

Attended by 158 participants from various agencies, including representatives from non-governmental organizations (NGOs) and 24 Orang Asli, the seminar managed to promote greater cooperation among stakeholders, besides discussing the challenges and way forward for sustainability of TK at the national level. The seminar also provided an excellent opportunity for various TK stakeholders to interact and enhanced their networking.

The keynote address was delivered by Prof Emeritus Dato’ Dr Hood Salleh, from UKM—a well-known scientist who has been conducting research on Orang Asli issues. The morning session was filled with presentations by FRIM’s TK research team, updating stakeholders on achievements to date on documentation efforts under the NRE project. Presentations from the JHEOA, the Sarawak Biodiversity Centre, Intellectual Property Corporation of Malaysia (MYIPO) and University Darul Iman Terengganu emphasized the need to continue documenting TK during the Tenth Malaysia Plan (2011–2015), before there is further erosion and loss of TK from the Orang Asli subethnics.

Seminar participants also had an opportunity to listen to presentations made by representatives of four Orang Asli subethnic groups, namely, the *Jahai* and *Temiar* from Banun (Perak), *Semelai* from Tasik Bera (Pahang), and *Semai* from Ulu Geroh (Perak), who had been involved in the documentation of their TK. The Orang Asli also participated in the exhibition, where they displayed the medicinal and aromatic plants used in their daily lives and shared knowledge and experience with participants.

The TK research team at FRIM also took the opportunity to introduce the contents of its planned website, scheduled to be completed by early 2011. Among other things, the website would include TK-related policy and laws, as well as Orang Asli TK experts involved with the documentation of TK.

dalam kehidupan harian serta berkongsi pengetahuan dan pengalaman dengan para peserta.

Pasukan penyelidik Projek TK FRIM turut mengambil peluang untuk memperkenalkan laman sesawang PT yang dijangka siap pada Januari 2011. Antara isi kandungan laman sesawang tersebut ialah dasar dan undang-undang berkaitan TK serta maklumat pakar TK Orang Asli yang terlibat dalam pendokumentasian TK.

Turut dibentangkan kepada peserta ialah hasil ujian biologi dan kimia yang menunjukkan hasil awal yang memberangsangkan, iaitu beberapa spesies terpilih berpotensi untuk dikomersialkan. Dengan sedikit lagi pertambahan dana untuk mengukuhkan lagi penemuan penyelidikan serta perkembangan prototaip, projek TK dijangka akan merintis jalan ke arah pembangunan pelbagai produk farmaseutikal, herba, kesihatan dan kosmeseutikal pada masa hadapan. Dalam jangka panjang, Malaysia dijangka akan menjana sumber-sumber kekayaan baharu daripada produk TK yang dibangunkan yang bukan sahaja memberi manfaat kepada negara malah juga pemilik pengetahuan—komuniti orang asal—menerusi mekanisme perkongsian faedah secara adil dan saksama yang belum lagi dibangunkan.

Early encouraging results from biological and chemical testing, indicating that several selected species show multiple potentials for commercialization, also were presented to participants. With a little bit more funding needed to further strengthen the research findings and development of prototypes, the TK project is expected to lead the way for the development of various pharmaceutical, herbal, health, and cosmetic products in the future. In the long run, Malaysia can expect to generate new sources of wealth from products developed from TK, thus benefiting not only the country as a whole but also the knowledge holders—indigenous communities *per se* through a fair and equitable benefit-sharing mechanism yet to be developed.



Majlis perasmian oleh Menteri NRE  
Opening ceremony by Minister of NRE



Ucapan oleh Prof Emeritus Dato' Dr Hood Salleh  
Keynote address by Prof Emeritus Dato' Dr Hood Salleh



Mahat Akiya mempersembahkan sajak bertajuk  
“Awang Pangan dan Untung Rugi Ayah Emak”  
Mahat Akiya presented his poem on “Awang  
Pangan dan Untung Rugi Ayah Emak”

## Bengkel Serantau ITTO-CITES-FRIM 2010

Sasaran Projek ITTO-CITES ‘Memastikan Perdagangan Antrabangsa bagi Spesies Pokok Balak yang Tersenarai Dalam CITES Konsisten Selaras dengan Pemeliharaan dan Pengurusan Secara Berkekalan’ adalah untuk menambah baik pengurusan dan juga pemeliharaan bagi *Gonystylus* spp. Terdapat sepuluh aktiviti utama di bawah projek ini yang telah dilaksanakan oleh Malaysia dan Indonesia, menyentuh pelbagai aspek tentang *Gonystylus* spp. Sebagai salah satu keperluan yang telah ditetapkan oleh projek, satu bengkel empat hari telah dianjurkan bertujuan untuk menyebarkan penemuan dan juga hasil kajian yang telah diadakan pada 1–4 Disember di Kuantan, Pahang, kira-kira 300 km dari Hutan Simpan Pekan, yang kebanyakan aktiviti lapangan bagi projek ITTO-CITES telah dijalankan dan juga merupakan tapak lawatan semasa bengkel berlangsung.

Objektif utama bengkel adalah untuk berkongsi, mempelajari dan membincangkan tentang penemuan-penemuan bagi setiap aktiviti yang telah dilaksanakan di Indonesia dan juga Malaysia di bawah Projek ITTO-CITES; untuk mengenal pasti dan mengadaptasi penemuan-penemuan yang relevan daripada aktiviti yang dijalankan; dan untuk mengenal pasti projek dan aktiviti yang berpotensi digunakan untuk memastikan perdagangan antarabangsa bagi *Gonystylus* spp. akan sentiasa berkekalan sesuai dengan amalan pengurusan dan juga pemeliharannya.

Seramai 61 peserta termasuk 11 dari Indonesia telah mengambil bahagian dalam bengkel ini. Delegasi Indonesia terdiri daripada pegawai-pegawai Pusat Penyelidikan dan Pembangunan Hutan dan Alam Semula Jadi (CFNCRD); *Forestry Industry Revitalization Board* (BRIK); Fakulti Perhutanan, Universiti Pertanian Bogor; Pusat Penyelidikan Biologi, dan Institut Sains Indonesia; manakala delegasi Malaysia pula adalah dari pelbagai agensi termasuk NRE; Jabatan Perhutanan Semenanjung Malaysia (JPSM); Jabatan Hutan Negeri di Semenanjung Malaysia; *Sarawak Forestry Corporation*; Lembaga Perindustrian Kayu-Kayan Malaysia (MTIB); Majlis Kayu-Kayan Malaysia (MTC); Majlis Persijilan Kayu-Kayan Malaysia (MTCC); institusi pengajian tinggi (Universiti Putra Malaysia, Universiti Malaysia Sabah dan Universiti Malaysia Pahang). Selain itu, wakil dari ITTO, CITES dan Penyelaras Projek Serantau turut menyertai Bengkel ini.

Upacara perasmian bengkel yang telah disempurnakan oleh Ketua Pengarah FRIM yang mewakili Ketua Setiausaha, NRE, diikuti ucap tamsil daripada wakil FRIM, CITES dan pembentangan 10 kertas kerja. Sebuah buku berjudul “*Gonystylus bancanus*—Jewel of Peat Swamp Forest” yang merupakan salah satu output projek juga telah dilancarkan selepas perasmian. Satu lawatan kerja telah diadakan pada hari kedua di Kompartmen 74 H.S. Pekan. Hari-hari yang berikutnya dikhususkan untuk sesi Perbincangan Kerja Berkumpulan untuk membuat ulasan secara terperinci isu-isu berkaitan dengan pelaksanaan aktiviti, mengenal pasti jurang dan juga hala tuju projek. Ketiga-tiga kumpulan telah mengutarakan beberapa saranan berserta ulasan dan Penyataannya telah dilakukan semasa penutupan bengkel.

## ITTO-CITES-FRIM Regional Workshop 2010

The aim of the ITTO–CITES Project on “Ensuring International Trade in CITES–listed Timber Species is Consistent with their Sustainable Management and Conservation” is to further enhance the conservation and sustainable management of *Gonystylus* spp. Under the project there were ten main activities related to various aspects of *Gonystylus* spp. to be jointly undertaken by Malaysia and Indonesia. As part of the project requirement, a four-day workshop aimed to disseminate the outcomes and findings from these activities was organized. The workshop was held from 1 to 4 December in Kuantan, Pahang, approximately 30 km from the Pekan Forest Reserve (FR) where some of the field activities under the ITTO–CITES Project were conducted and where a field visit was held in conjunction with the workshop.

The main objectives of the workshop were to share, learn and discuss the findings of each activity implemented in Indonesia and Malaysia under the ITTO–CITES Project; to identify and adapt relevant findings from the Indonesian activities by Malaysia and vice versa; and to identify potential projects and activities to further ensure that the international trade in *Gonystylus* spp. is consistent with their sustainable management and conservation practices.

A total of 61 participants including 11 from Indonesia participated in the workshop. The Indonesian delegates comprised officers from the Center for Forest and Nature Conservation Research and Development (CFNCRD); the Forestry Industry Revitalization Board (BRIK); Faculty of Forestry, Bogor Agricultural University; Research Center for Biology, and the Indonesian Institute of Sciences. The Malaysian delegates were from various agencies including the NRE; Forestry Department Peninsular Malaysia (FDPM); State Forestry Departments in Malaysia; Sarawak Forestry Corporation; Malaysian Timber Industry Board (MTIB); Malaysian Timber Council (MTC); Malaysian Timber Certification Council (MTCC); and institutes of higher learning (Universiti Putra Malaysia, Universiti Malaysia Sabah and Universiti Malaysia Pahang). In addition, representatives from ITTO and CITES and the Regional Project Coordinator also attended the workshop.

The workshop was officiated by the Director General of Forest Research Institute Malaysia (FRIM) on behalf of the Secretary General of NRE, followed by speeches from FRIM and ITTO–CITES representatives and ten presentations. A book entitled “*Gonystylus bancanus*—Jewel of Peat Swamp Forest”, one of the project outputs, was also launched in the opening session. A study tour was organized to the Compartment 74 Pekan Forest Reserve on the second day. The following days were dedicated to Working Group Discussions which reviewed in detail issues related to the activity implementation, gap identification and way forward. The Groups prepared a broad range of recommendations, which were reviewed and a Statement was adopted upon conclusion of the Workshop.

Output bagi bengkel ini ialah sebuah laporan yang mengandungi saranan dan cadangan pelaksanaan aktiviti di Indonesia dan Malaysia di bawah Projek ITTO-CITES dan juga satu senarai lengkap aktiviti-aktiviti baharu yang berpotensi untuk diketengahkan dalam menjamin pengurusan dan pemeliharaan secara berkekalan bagi *Gonystylus* spp. serta prosiding bengkel.

The main output of the workshop was a report on the recommendation of activities implemented in Indonesia and Malaysia under the ITTO-CITES Project, a list of identified potential new activities to further enhance the sustainable management and conservation of *Gonystylus* spp., and a the workshop proceedings.



Delegasi, peserta dan juga penganjur Bengkel ITTO-CITES-FRIM  
Delegates, participants and organizers of ITTO-CITES-FRIM Workshop



Pelancaran buku "*Gonystylus bancanus*—Jewel of Peat Swamp Forest" oleh KP FRIM  
Launching of the book entitled "*Gonystylus bancanus*—Jewel of Peat Swamp Forest" by FRIM DG

## PAMERAN

Pada tahun 2010, FRIM telah mengambil bahagian dalam 22 pameran di dalam negara. Peranan pameran ini tidak kurang pentingnya kerana melaluinya aktiviti pemindahan teknologi dapat dilaksanakan. Pameran juga merupakan satu medium untuk para penyelidik FRIM menguji tahap kepakaran mereka menerusi pertandingan reka cipta dan inovasi seperti *Malaysia Technology Expo (MTE)*, *International Invention, Innovation and Technology Exhibition (ITEX)* dan *Bio Malaysia*. FRIM juga dapat menjalankan tanggungjawab korporat dan sosial kepada masyarakat melalui aktiviti pameran ini. Sepanjang tahun 2010, FRIM telah mencatat dua kejayaan dalam pertandingan kreativiti hiasan gerai pameran terbaik. Kejayaan tersebut ialah Johan Pertandingan Rekaan Gerai Pameran kategori *Shell Scheme Booth* di Pameran Bio Malaysia (peringkat Kebangsaan) dan Johan Anugerah Rekaan dan Hiasan Pameran Terbaik sempena Hari Inovasi Kementerian Sumber Asli dan Alam sekitar (peringkat Kementerian).



Lawatan oleh Tan Sri Datuk Seri Panglima Joseph Kurup, Timbalan Menteri NRE ke ruang pameran FRIM sempena ISFFP 2010  
Visit by Tan Sri Datuk Seri Panglima Joseph Kurup, Deputy Minister of NRE, to FRIM's booth during ISFFP 2010

## EXHIBITIONS

In 2010, FRIM successfully participated in 22 exhibitions in the country. For FRIM, an exhibition is important in facilitating technology transfer, serving also as a platform for the researchers to demonstrate their levels of expertise through design and innovation competitions such as the Malaysia Technology Expo (MTE), the International Invention, Innovation and Technology Exhibition (ITEX) and the Bio Malaysia. An exhibition also allows FRIM to carry out its corporate and social responsibility (CSR) to the community. In 2010 FRIM won two awards for the best decorated booth, namely "Champion for Booth Design Competition for Shell Scheme Booth Category" during the Bio Malaysia (National Level) and "Champion for Best Booth Design and Decoration" during the Innovation Day celebration organized by the Ministry of Natural Resources and Environment Malaysia (Ministry Level).



Antara maklumat dan produk hasil penyelidikan FRIM yang dipamerkan semasa ISFFP 2010  
Some of the information and research products displayed during ISFFP 2010



Lawatan oleh Tan Sri Muhyiddin Hj Mohd Yassin, Timbalan Perdana Menteri Malaysia ke ruang pameran FRIM semasa Pameran Bio Malaysia, pada 1 November 2010 di Kuala Lumpur Convention Centre (KLCC)

Visit by YAB Tan Sri Muhyiddin Hj Mohd Yassin, Deputy Prime Minister of Malaysia, to FRIM's booth during Bio Malaysia Exhibition



Dato Sri Douglas Uggah Embas, Menteri NRE ke ruang pameran FRIM semasa Hari Inovasi NRE pada 10 November 2011  
Visit by Dato Sri Douglas Uggah Embas, Minister of NRE, to FRIM's booth during the Innovation Day 2011



Pameran sempena FLORIA 2010 di Putrajaya  
Exhibition during FLORIA 2010 at Putrajaya

**PAMERAN YANG MENYOKONG PEMINDAHAN TEKNOLOGI YANG DISERTAI OLEH FRIM**  
**EXHIBITIONS THAT SUPPORTED TECHNOLOGY TRANSFER PARTICIPATED BY FRIM**

BIL. NO.	TAJUK TITLE	TARIKH DATE
1	Malaysia Technology Exposition (MTE), PWTC, Kuala Lumpur	4–6 Februari/February
2	Malaysian International Furniture Fair (MIFF), PWTC, Kuala Lumpur	2–6 Mac/March
3	Pameran Sempena Corporate Social Responsibility (CSR) NRE, Kelab Golf Kinrara, Selangor	5–8 Mac/March
4	Pameran Sempena Mesyuarat IUFRO, Kuala Lumpur	8–12 Mac/March
5	Pameran Sempena Seminar ITTO, Kuala Lumpur	22 Mac/March
6	Pameran Sempena Majlis Pelancaran Kempen Menanam 26 Juta Pokok, Putrajaya	21–24 April
7	International Invention, Innovation and Technology Exhibition (ITEX), Kuala Lumpur Convention Centre (KLCC)	14–16 Mei/May
8	Malaysia Domestic Tourism Fair, PWTC, Kuala Lumpur	14–16 Mei/May
9	Pameran Sempena National Conference on Sustainability Malaysia 2010, Universiti Malaya, Kuala Lumpur	25 Mei/May
10	Pameran Sempena Festival Sains Teknologi Inovasi Selangor (FesSTIS) 2010, Shah Alam	11–13 Jun/June
11	World Halal Research Summit (WHR) 2010, Kuala Lumpur Convention Centre (KLCC)	23–25 Jun/June
12	FLORIA Putrajaya, Putrajaya	10–18 Julai/July
13	Pameran Sempena 2nd International Conference on Oil Palm Biomass (ICOPB2010), MATRADE Exhibition Convention Centre (MECC), Kuala Lumpur.	2–3 Ogos/August
14	International Symposium on Forestry and Forest Products 2010 (ISFFP), Kuala Lumpur	5–7 Oktober/October
15	Pameran Sambutan Minggu Alam Sekitar Malaysia (MASM), Agensi di Bawah NRE Sempena MASM Peringkat Kebangsaan 2010, Wisma Sumber Asli, Putrajaya	21–23 Oktober/October
16	Pameran Sempena International Conference and Exhibition on The Rehabilitation, Restoration and Transformation of Mining Land, Sunway Pyramid Convention Centre	1–3 November
17	Pameran Bio Malaysia, Kuala Lumpur Convention Centre (KLCC).	1–3 November
18	Pameran Sempena Hari Inovasi Kementerian Sumber Asli dan Alam Sekitar (NRE) 2010, Wisma Sumber Asli, Putrajaya	9–10 November
19	Pameran Promosi & Publisiti <i>Groombig</i> Usahawan Peringkat Nasional, Menara MITI, Putrajaya	12–14 November
20	Pameran Bio Career 2010 (Career Fair & Exhibition), Kuala Lumpur Convention Centre (KLCC)	13–14 November
21	Malaysia Agriculture, Horticulture and Agrotourism International Show (MAHA), MAEPS, Serdang	26 November–5 Disember/December

## INOVASI DAN KOMERSIALISASI INNOVATION AND COMMERCIALIZATION

Pada tahun ini, FRIM telah berjaya mengendalikan 39 khidmat perundingan yang bernilai RM 894 186 kepada kedua-dua sektor awam dan swasta. Penyelidikan FRIM juga telah berjaya menjana 15 pendedahan reka cipta, dua pemfailan paten dan satu pengiktirafan paten. FRIM juga telah berjaya menandatangani lima perjanjian pelesenan. Senarai khidmat perundingan, pendedahan reka cipta dan perjanjian adalah seperti yang berikut:

During the year, FRIM conducted 39 consultancies worth RM894 186. FRIM's research findings led to 15 invention disclosures, two patent filings and one patent granted. FRIM also successfully signed five licensing agreements. A list of the consultancy services, invention disclosures and agreements is given as follows:

### IKHIDMAT PERUNDINGAN/CONSULTANCY SERVICES

BIL. NO.	BIDANG FIELD	PENGURUS PROJEK PROJECT MANAGER	PELANGGAN CLIENT
1	Penyelenggaraan (2009/2010) Sistem Pengurusan Gaji MARDI (esPG MARDI)	Wan Zahiri Hj Wan Yaacob	Institut Penyelidikan dan Kemajuan Pertanian Malaysia / Malaysian Agriculture Research and Development Institute (MARDI)
2	Tree risk assessment	Sreetheran Maruthaveeran	The Royal Selangor Golf Club
3	Monitoring, diagnosis and identification of pests and diseases in <i>Acacia</i> plantations	Dr Lee Su See	Grand Perfect Sdn Bhd
4	Tree risk assessment	Sreetheran Maruthaveeran	The Royal Selangor Golf Club
5	Menjalankan inventori pokok dan menginput data ke sistem inventori pokok dan menghasilkan pelan inventori pokok	Adnan Mohammad	Tropics Plantscape Sdn Bhd
6	Khidmat kepakaran sempena Kursus Pengecaman Kayu Peringkat Asas untuk pelatih-pelatih Kraftangan Malaysia Cawangan Pahang	Dr Hamdan Husain	Perbadanan Kemajuan Kraftangan Malaysia Cawangan Pahang
7	Tree risk assessment on selected trees at The Datai & Andaman	Dr Elizabeth Philip	Ms Eleanor Hardy
8	Perundingan penubuhan ladang <i>Jatropha</i> di Sabah	Nor Azman Hussein	Konsortium Jaringan Usahawan (Sabah) Sdn Bhd
9	Bancian dan pemetaan vegetasi di tapak Pusat Penyelidikan Tasik Chini	Wan Mohd Shukri Wan Ahmad	Pusat Penyelidikan Tasik Chini
10	Advisory/consultancy services in plant cell, tissue & organ culture technology	Dr Kodi Isparan Kandasamy	Celltis Sdn Bhd
11	Menjalankan kerja perundingan 'The economics of karas ( <i>Aquilaria</i> spp. on plantation for gaharu production'	Mohd Parid Mamat	Grandview Plantations Sdn Bhd
12	Latihan serta penyelidikan berkenaan fiber secara pakej	Dr Rushdan Ibrahim	SPPT Engineering Sdn Bhd
13	Single and Two-Choice Test for Efficacy of Preservatives Against Subterranean Termites	Shahlinney Lipeh	Arch Wood Protection (M) Sdn Bhd
14	Assessment of Trees for Conservation	Dr Elizabeth Philip	Mr Brahmam Vasudevan (Pacific Straits Realty S/B)
15	Review of the National Water Resources Study (2000–2050) and Formulation of National Water Resources Policy	Dr Abdul Rahim Nik	Ranhill Bersekutu Sdn Bhd
16	Verification Against HSBC Standard for Complying with Requirement on Legality, HCVF and Indigenous People's Customary Rights on Shin Yang Forestry Sdn Bhd	Dr Lim Hin Fui	SIRIM QAS International Berhad
17	Advisory/Consultancy Services in Plant Tissue Culture	Dr Kodi Isparan Kandasamy	Malaysian Agrifood Corporation Berhad (MAFC)

BIL. NO.	BIDANG FIELD	PENGURUS PROJEK PROJECT MANAGER	PELANGGAN CLIENT
18	Silvikultur dan Pengurusan Ladang Hutan <i>Aquilaria</i>	Lok Eng Hai	Syarikat PT. Sri Langit
19	Quantification of Carbon Stocks and Sequestration Rate and Timber Values at Petronas Existing Assets	Dr Norini Haron	Petroleum Nasional Berhad
20	Kursus Pemeriksaan Pokok Berbahaya bagi Kakitangan Jabatan Taman Botani	Sreetheran Maruthaveeran	Jabatan Taman Botani Pulau Pinang
21	Kualiti dan Kemasan Kayu	Dr Hamdan Husain	Ekowood (M) Sdn Bhd
22	Pemeriksaan Pokok Bagi Tujuan Pindahkan/Transplanting	Adnan Mohammad	Fau Arkitek
23	Inventori Pokok dan Penyediaan Maklumat dalam SIP	Adnan Mohammad	Minang Agro Sdn Bhd
24	Analisis Black Liquor	Dr Rushdan Ibrahim	Eko Pulp & Paper Sdn Bhd
25	Monitoring, Diagnosis and Identification of Pests and Diseases in <i>Acacia</i> Plantations	Dr Lee Su See	Grand Perfect Sdn Bhd
26	Aplikasi Sistem e-T&T MARDI	Zahari Othman	Institut Penyelidikan Dan Kemajuan Pertanian Malaysia (MARDI)
27	Reka Bentuk Pintu Rintang Api (PRA)	Khairul Azmi Jabar	Pyro-Tech Systems Sdn Bhd
28	Menjalankan Bancian dan Pemetaan Biojisim Sisa Perakayuan (Agro & Forestry Waste/Residue) Negara dan Membekalkan Maklumat Kepada Projek 'National Renewable Energy Resources Mapping & Assessment' SIRIM	Dr Khali Aziz Hamzah	SIRIM Berhad
29	Peperiksaan Pokok Berbahaya	Sreetheran Maruthaveeran	The Royal Selangor Golf Club
30	Penanaman, Silvikultur dan Pengurusan Ladang Hutan <i>Aquilaria</i> (Karas)	Lok Eng Hai	En Mazlan Talib
31	Asia Prima RCF - Recertification	Dr Lim Hin Fui	SIRIM QAS International Berhad
32	Menyediakan Kertas Konsep "Bio Palms Environment Concept"	Dr Ab Rasip Ab Ghani	Cross BioPalms Sdn Bhd
33	EIA on the Proposed Forest Operation in Pahang	Dr Shamsudin Ibrahim	Universiti Putra Malaysia
34	EIA on the Proposed Forest Operation in Terengganu	Dr Shamsudin Ibrahim	Universiti Putra Malaysia
35	EIA on the Proposed Forest Operation in Kelantan	Dr Shamsudin Ibrahim	Universiti Putra Malaysia
36	Penanaman, Silvikultur dan Pengurusan Ladang Hutan <i>Aquilaria</i> (Karas)	Lok Eng Hai	En Mohamed Johari B Omar
37	Wood Identification & Wood Durability Test (Termite Test)	Shahlinney Lipeh	Veritas Architects Sdn Bhd
38	Efficacy Test on Enseal Treated Rubberwood Against Decay Fungi	Dr Salmiah Ujang	Arch Wood Protection (M) Sdn Bhd
39	Monitoring, Diagnosis and Identification of Pests and Diseases in <i>Acacia</i> Plantations	Dr Lee Su See	Grand Perfect Sdn Bhd

#### PELESENAN/LICENSING

BIL. NO.	TEKNOLOGI TECHNOLOGY	PELESEN LICENSEES
1	Technology for Cultivation of Plant Cell and Organs of Kacip Fatimah and Karas	Celltis Sdn Bhd
2	Technology to Produce Fiber from Empty Fruit Bunches of Oil Palm	Sumber Teraju Sdn Bhd
3	The Making of Torrified <i>Acacia</i> Wood as Bio-Coal for Sustainable Green Energy	Che Dzayauddin Ishak Sdn Bhd
4	Pemprosesan dan Modifikasi Sumber Lignoselulosa Tempatan Seperti Tandan Kosong Kelapa Sawit dengan PVC untuk menghasilkan Produk Wood Polymer Composite (WPC)	Industrial Resins (M) Sdn Bhd (MOU)
5	Inovatif Pembakaran Tandan Kosong Kelapa Sawit (TKS) Terawat dalam Dandang bagi Mengatasi Kesan Negatif Sebagai Bahan Bakar untuk Penjanaan Kuasa Berasaskan Biojisim Melalui Model Berkala Besar	Garisan Etika Sdn Bhd (MOU)

## KERJASAMA PENYELIDIKAN RESEARCH COLLABORATIONS

### Kerjasama Penyelidikan Menerusi Memorandum Persefahaman/Perjanjian

Jawatankuasa Pemantau MoU/Perjanjian (JKPM) telah menyenarai pendekkan kepada kerjasama penyelidikan yang aktif sahaja berjumlah 46. Ini termasuklah 28 MoU dan 18 perjanjian. Sepanjang tahun 2010 sebanyak 26 cadangan projek kerjasama baharu telah dinilai dalam lima mesyuarat JKPM. Dalam tempoh yang sama 21 dokumen ikatan projek kerjasama telah dimeterai.

### Research Collaborations Through Memorandum of Understanding and Agreements

The committee for the monitoring of MoUs/Agreements (JKPM) had short-listed 46 research collaboration projects that were active. These included 28 MoUs and 18 agreements. In the year, 26 new collaborative project proposals were evaluated at five JKPM meetings. During the same period 21 documents for collaborative projects were signed.

BIL NO	RAKAN KERJASAMA PARTNER	BIDANG-BIDANG YANG KERJASAMA FIELD OF COLLABORATION	KETUA PROJEK PROJECT LEADER	TARIKH DIMETERAI SIGNING DATE
1	HERBagus Sdn Bhd	Sustainable supply of misai kucing ( <i>Orthosipon stamineus</i> ) raw material	Mohd Zamree Md. Shah	23 Februari February
2	I & R Herbal Industries Sdn Bhd	Sustainable supply of mas cotek ( <i>Ficus deltoidea</i> ) raw material	Dr Fadzureena Jamaludin	23 Februari February
3	SIRIM QAS International Sdn Bhd	Testing and certification services in forestry and forest products	Dr Rahim Sudin	4 Mac/March
4	Institute for Medical Research (IMR) and Universiti Sains Malaysia (USM)	Acquisition and implementation of three "new" helminthic screening	Dr Getha Krishnasamy	11 Mac/March
5	Japan International Research Center for Agricultural Sciences (JIRCAS)	Development of an ethanol production system using the residues of sap-squeezed oil palm trunks	Dr Wan Asma Ibrahim	1 April
6	Universiti Putra Malaysia (UPM)	Determination of the effect of <i>Tinospora crispa</i> extract supplementation on blood lipid profiles, antioxidant activity and atheroma plaque formation in rabbit induced hypercholesterolemia	Khairul Kamillah	16 April
7	Malaysian Biotechnology Corporation Sdn Bhd	Bionexus partners programme agreement on shared facilities	Dr Rasadah Mat Ali	23 April
8	Malaysian Biotechnology Corporation Sdn Bhd	Bionexus partners programme agreement on shared facilities	Dr Norwati Muhammad	23 April
9	Universiti Kuala Lumpur (UniKL)	Research and development on bamboo composite product for potential utilization in aviation industries	Dr Shamsudin Ibrahim	18 Mei/May
10	SIRIM Berhad	National renewable energy resource mapping and assessment	Dr Khali Aziz Hamzah	20 Julai/July
11	Focal Biotek Sdn Bhd	Upscaling of tongkat ali hairy root culture using bioreactor technology for the production of bioactive compounds	Dr Nor Hasnida Hassan	21 Julai/July
12	Lembaga Perindustrian Kayu Malaysia (MTIB)	Perjanjian pembiayaan projek penyelidikan dan pembangunan hutan ladang	Dr Ahmad Zuhaidi Yahya	12 Ogos/ August
13	Industrial Resins (Malaysia) Sdn Bhd	Research and development in the field of processing and modification of local natural fibres with polyvinyl chloride (PVC)	Dr Rahim Sudin	16 Ogos/ August
14	Kementerian Kemajuan Luar Bandar dan Wilayah (KKLW)	Pelaksanaan latihan kemahiran, teknologi makanan dan teknologi pertanian	Liza Ismail	26 Ogos/ August
15	Hasro Furniture Gallery (M) Sdn Bhd	The utilization and commercialization of wood residues for the production of pellet and other value-added products	Puad Elham	18 Oktober/ October

16	Garisan Etika (M) Sdn. Bhd.	An innovative technology to develop boiler philosophy and to overcome the ill-effects of utilizing empty fruit bunch (EFB) as fuel towards maximum reability for biomass power generation through a pilot model	Dr Wan Asma Ibrahim	18 Oktober/ October
17	KAR Masterpiece Sdn. Bhd.	Customization of the acquired processing technology for the development of high value bamboo planks for structural and non-structural applications in Malaysia	Nor Azman Hussein	20 Oktober/ October
18	Abdul Wahab bin Dollah	Projek penyelidikan inokulasi karas untuk pengeluaran gaharu dan minyak gaharu	Dr Ahmad Zuhaidi Yahya	22 Oktober/ October
19	Bioversity International	Enhancing sustainable forest management and conservation strategies through genetic-level research using <i>Shorea leprosula</i> and <i>S. parvifolia</i> as model species	Dr Lee Soon Leong	27 Oktober/ October
20	University of Melbourne	Co-operation in the field of forestry research and higher learning education	Pn. Wan Rahmah Wan A. Raof	18 November
21	NR Elite Group (Penang) Sdn. Bhd.	Setting-up a pilot plant to upscale the production of pulp from kenaf core as a fibrous raw material for papermaking	Dr Rushdan Ibrahim	21 November

Projek-projek baharu yang dimeterai melibatkan lima kerjasama R&D, lima pembangunan produk, lima kemudahan dan perkhidmatan penyelidikan, dua pengeluaran bahan mentah, dua inisiatif komersialisasi dan dua latihan. FRIM menjalankan penyelidikan bersama-sama Universiti Putra Malaysia (UPM) (kesan ekstrak *Tinospora crispa*); UniKL (produk komposit buluh); Lembaga Industri Kayu-Kayan Malaysia (MTIB) (kajian hutan ladang); Abdul Wahab (kajian inokulasi karas); dan Bioversity International (penyelidikan genetik). Contoh kerjasama untuk pembangunan projek sistem pengeluaran etanol (bersama-sama JIRCAS) dan peningkatan kultur akar rerambut tongkat ali (Focal Biotek Sdn. Bhd.). FRIM bersetuju untuk menyediakan perkhidmatan kepada SIRIM Berhad dan SIRIM QAS.

Buat pertama kali sesi penilaian atau *viva* telah dijalankan ke atas projek-projek yang masih aktif dan yang baru ditamatkan. Sejumlah 41 projek MoU dan sembilan projek Perjanjian telah dinilai pada 16 Ogos dan 29 November. Hasil *viva* tersebut telah merungkai beberapa isu untuk penambahbaikan pengurusan projek kerjasama oleh ketua projek dan pemantauan oleh sekretariat JKPM. Kebanyakan projek yang dinilai adalah untuk memberi ruang kepada pegawai penyelidik mengamalkan ilmu dan pengalamannya selain mengetengahkan hasil penyelidikan untuk dimanfaatkan, dibangunkan lagi atau dikomersialkan. Kebanyakan projek tidak melibatkan pulangan dana kepada FRIM. Namun kerjasama yang terjalin adalah penting untuk FRIM melebarkan usaha R&D dan bagi mendapat status sebagai sebuah badan akreditasi.

The new projects endorsed for the year involved collaborations in five R&D, five product development, five research facilities and services, two production of materials, two commercialization initiatives, and two training projects. FRIM was to conduct research together with UPM (effect of *Tinospora crispa* extract), UniKL (bamboo composite product), MTIB (forest plantation studies), Abdul Wahab (inoculation experiment on karas), and Bioversity International (genetic-level research). Two examples of collaboration in product or system development are ethanol production with JIRCAS, and upscaling of tongkat ali hairy root culture with Focal Biotek Sdn Bhd. FRIM agreed to provide services to SIRIM Berhad and SIRIM QAS.

For the first time, viva sessions were conducted to evaluate active and recently completed projects. A total of 41 MoUs and nine agreement projects were evaluated on 16 August and 29 November. The viva managed to unfold a few issues to improve the management of projects by the project leaders and monitoring by JKPM secretariat. Many of the evaluated projects created avenues for research officers to apply their knowledge, experience and research outputs that can benefit others and be further developed or commercialized. Although most of the projects do not give financial returns to FRIM, the collaborative effort is important for FRIM to broaden its R&D endeavour and build and improve its image and capability as an accreditation body.



MoU dengan UniKL MIAT  
MoU with UniKL MIAT



MoU dengan I & R Industries  
Mou with I & R Industries



MoU dengan Hasro Furniture  
MoU with Hasro Furniture

## HAL EHWAL ANTARABANGSA INTERNATIONAL AFFAIRS

Sebagai sebuah institusi yang terkenal dalam penyelidikan bidang perhutanan dan keluaran hutan tropika, penjawat awam FRIM terus memainkan peranan utama di arena antarabangsa. Di samping terlibat dalam perundingan serta memberikan input teknikal di pelbagai konvensyen, seperti Konvensyen Biodiversiti (CBD), FRIM sebagai sebuah institusi turut menyertai pelbagai acara sampingan di bawah *Asia Pacific Association of Forestry Research Institutions* (APAFRI) sempena Kongres Sedunia IUFRO XXIII, menjadi tuan rumah kepada Jawatankuasa Pengurusan *International Union of Forestry Research Organization* (IUFRO) di FRIM, serta menganjurkan Simposium Antarabangsa Perhutanan dan Keluaran Hutan. Saintis FRIM turut menerima Anugerah Pencapaian Saintifik IUFRO yang berprestij serta Anugerah Penuntut bagi Kecemerlangan dalam Sains Perhutanan sempena Kongres Sedunia IUFRO XXIII di Korea. FRIM sekali lagi turut berbangga dengan pelantikan Dr Lee Su See selaku wanita pertama sebagai Naib Presiden IUFRO, dari 2010 hingga 2014. Berikut ialah beberapa aktiviti terpilih yang melibatkan FRIM di sepanjang tahun 2010.

### Aktiviti IUFRO

Tahun 2010 merupakan tahun yang sibuk bagi IUFRO memandangkan pada tahun ini berlangsung Kongres Sedunia IUFRO XXIII serta pelantikan ahli Lembaga baharu bagi penggal 2010–2014. Lembaga IUFRO kebiasaannya dilantik bagi satu penggal, iaitu lima tahun. Bagaimanapun, memandangkan Kongres Sedunia IUFRO XXIV akan diadakan pada tahun 2014, keahlian yang baharu hanya akan memakan masa empat tahun. Pada mesyuarat Lembaga IUFRO yang diadakan pada 2009, undang-undang IUFRO telah diubah bagi membolehkan ahli Lembaga yang baharu dapat terus bertugas selepas pelantikan dan pengesahan oleh Majlis Antarabangsa IUFRO semasa Kongres Sedunia tanpa perlu menunggu tahun kalendar yang berikutnya.

Seperti pada tahun-tahun sebelumnya, pada 2010 pelbagai mesyuarat, bengkel dan simposium telah dianjurkan oleh IUFRO di seluruh dunia dan banyak penerbitan telah dihasilkan. Maklumat terperinci boleh didapati di laman sesawang IUFRO <http://www.iufro.org>. Penerbitan IUFRO dan penerbitan lain yang berkaitan dengan perhutanan boleh juga didapati di <http://www.gfis.net>, iaitu laman sesawang Perkhidmatan Maklumat Hutan Sedunia IUFRO.

Jawatankuasa Pengurusan (MC) IUFRO telah mengadakan mesyuarat di FRIM dari 24–26 Mac serta melawat tapak pemuliharaan hutan bakau FRIM di Sg Hj Dorani, Kuala Selangor. Banyak isu dibincangkan semasa mesyuarat MC dan Lembaga IUFRO di sepanjang 2010 berkisar pada kemajuan dalam pelaksanaan Strategi IUFRO 2006–2010 dan pemurnian Strategi IUFRO 2010–2014 "*Reading the pulse of forest science for the benefit of forests and people*". Enam bidang tematik telah dikenal pasti mengenai strategi baharu dalam kerjasama pelbagai disiplin iaitu i) Hutan untuk Manusia, ii) Hutan dan Perubahan Iklim, iii) Biotenaga

As an institution renowned for its research on tropical forestry and forest products, FRIM continued to play a major role in many events in the international arena. Besides being involved in negotiations and giving technical input at various conventions, such as the Convention on Biodiversity (CBD), FRIM as an institution also participated in a number of side-events under the Asia Pacific Association of Forestry Research Institutions (APAFRI) at the XXIII IUFRO World Congress, hosted the International Union of Forestry Research Organization (IUFRO) Management Committee on FRIM's grounds, and organized an International Symposium on Forestry and Forest Products. To add to the already long list of their international involvements, FRIM scientists also received the IUFRO's prestigious Scientific Achievement Award and won the IUFRO's Student Award for Excellence in Forest Science during the XXIII IUFRO World Congress in Korea. FRIM's flag again is flying high with the election of Dr Lee Su See as the first-ever female Vice-President of IUFRO, from 2010 to 2014. The following paragraphs are excerpts of selected activities in which FRIM as an institution was involved throughout 2010.

### IUFRO Activities

2010 was a busy year for IUFRO as this was the year the XXIII IUFRO World Congress was held and a new Board appointed for the 2010 to 2014 term. The IUFRO Board is normally elected for a term of five years but in view of the XXIV IUFRO World Congress being held in 2014, the new Board's term will only be for four years. At the last IUFRO Board meeting held in 2009, the IUFRO statutes were changed so that the new Board would take office immediately after its election and confirmation by the IUFRO International Council during the World Congress instead of following the calendar year.

As in previous years, in 2010 numerous meetings, workshops and symposia were held under the IUFRO banner all over the world and many publications produced. Details can be obtained from the IUFRO website <http://www.iufro.org>. IUFRO publications and other forest related publications can also be found at <http://www.gfis.net>, IUFRO's Global Forest Information Services website. The IUFRO Management Committee (MC) met at FRIM from 24 to 26 March and a visit to the FRIM mangrove rehabilitation site at Sungai Hj Dorani, Kuala Selangor, was also made.

Important issues discussed at the IUFRO MC and Board meetings in 2010 were the progress in the implementation of the IUFRO Strategy 2006–2010 and refinement of the IUFRO Strategy 2010–2014 "*Reading the pulse of forest science for the benefit of forests and people*". Six thematic areas have been identified in the new strategy for cross-disciplinary collaboration. These are i) Forests for People, ii) Forests and Climate Change, iii) Forest Bioenergy, iv) Forest Biodiversity Conservation, v) Forest and Water Interactions, and vi) Resources for the Future. Actions for implementation will be discussed and developed at the forthcoming Board Meeting to be held in February 2011.

Hutan, iv) Pemuliharaan Biodiversiti Hutan, v) Hutan dan Interaksi Air, dan vi) Sumber untuk Masa Hadapan. Tindakan untuk pelaksanaan akan dibincangkan semasa mesyuarat Lembaga pada Februari 2011.

Aktiviti utama bagi kebanyakan ahli IUFRO serta para saintis yang terlibat dalam penyelidikan hutan dan yang berasaskan hutan pada 2010 ialah Kongres Sedunia XXIII IUFRO yang berlangsung di Seoul, Korea Selatan 23–28 Ogos. Kongres dihadiri oleh lebih daripada 2000 peserta dari 92 negara, iaitu peserta paling ramai dalam sejarah Kongres dengan 2027 pembentangan dan 1053 poster. Pelbagai Anugerah IUFRO telah diberikan semasa Kongres. Dua penjawat awam FRIM, Dr Nor Azah Mohamad Ali dan Ms Tnah Lee Hong merupakan antara pemenang. Dr Nor Azah menerima Anugerah Pencapaian Saintifik yang berprestij manakala Cik Tnah memenangi Anugerah Penuntut bagi Kecemerlangan dalam Sains Perhutanan IUFRO. FRIM turut berbangga dengan pemilihan Dr Lee Su See selaku Naib Presiden IUFRO wanita yang pertama.

Pada 2010 IUFRO bergerak aktif di arena antarabangsa, yang mewakili pelbagai mesyuarat penting dunia antaranya ialah CBD COP10, ITTO dan COFO. IUFRO turut menjadi tuan rumah bersama Hari Hutan 4 sempena mesyuarat UNFCCC di Cancun, Mexico. Tahun 2010 turut menyaksikan perubahan dalam kepimpinan Sekretariat IUFRO. Alexander Buck telah dilantik sebagai Pengarah Eksekutif IUFRO untuk menggantikan Peter Mayer yang telah dilantik sebagai Ketua Pengarah, Pusat Penyelidikan dan Latihan Hutan, Bencana Alam dan Landskap Persekutuan, Austria.

The highlight for most IUFRO members and scientists involved in forestry and forestry related research in 2010 was the XXIII IUFRO World Congress held in Seoul, South Korea, from 23 to 28 August. The congress was attended by more than 2700 participants from 92 countries, the largest number of participants in the congress' history with a total of 2027 presentations and 1053 posters. Various IUFRO Awards were presented during the congress, and two FRIM staff members, Dr Nor Azah Mohd Ali and Ms Tnah Lee Hong, were among the award winners. Dr Nor Azah was awarded the prestigious Scientific Achievement Award (SAA) while Ms Tnah won the IUFRO Student Award for Excellence in Forest Science (ISA). FRIM was also made proud with the election of Dr Lee Su See as the first-ever female Vice-President of IUFRO.

In 2010 IUFRO was active in the international arena, being represented at many high level meetings, among them CBD COP10, ITTO, COFO. IUFRO also co-hosted Forest Day 4 during the UNFCCC meeting in Cancun, Mexico. 2010 also saw a change in the leadership of the IUFRO Secretariat. Alexander Buck was appointed IUFRO Executive Director to replace Peter Mayer, who was appointed Director General, Federal Research and Training Centre for Forests, Natural Hazards and Landscape (BFW) of Austria.



Presiden IUFRO yang akan tamat perkhidmatannya, Prof Don Koo Lee, memperkenalkan ahli-ahli Lembaga IUFRO bagi penggal 2010–2014.  
The outgoing IUFRO President, Prof Don Koo Lee, introducing the new IUFRO Board members for the 2010–2014 term.



Ahli-ahli MC IUFRO melawat projek pemulihan bakau di Sg Hj Dorani, Kuala Selangor  
 IUFRO MC members visiting the mangrove rehabilitation project at Sg Hj Dorani, Kuala Selangor



Ahli-ahli MC IUFRO bersama-sama KP FRIM  
 IUFRO MC members with the FRIM DG



Dr Nor Azah Mohd Ali menerima Anugerah Pencapaian Saintifik daripada Presiden IUFRO, Prof Don Koo Lee  
 Dr Nor Azah Mohd Ali receiving her Scientific Achievement Award from the IUFRO President, Prof Don Koo Lee

## Persatuan Institusi Penyelidikan Perhutanan Asia Pasifik (APAFRI)

APAFRI sekali lagi telah mencapai pelbagai kejayaan yang cemerlang pada 2010. Antaranya yang utama ialah peranan utama APAFRI semasa Kongres Sedunia IUFRO 2010 di Seoul; menamatkan dengan jayanya Projek ITTO tentang sumber-sumber genetik hutan; bengkel latihan di Coimbatore, India; dan *Asia Pacific Symposium on Vulnerability Assessments* di Manila, Filipina.

Tahun 2010 merupakan tahun yang signifikan; antaranya ialah pengisytiharan 2010 sebagai Tahun Biodiversiti Antarabangsa oleh Bangsa-Bangsa Bersatu, dan penganjuran pelbagai aktiviti di seluruh dunia bagi meningkatkan kesedaran untuk melindungi kekayaan semula jadi yang tiada gantinya serta mengurangkan kehilangan biodiversiti. APAFRI, walaupun tidak terlibat secara langsung dalam aktiviti sedunia tersebut, telah menyumbang kepada aktiviti berkaitan di rantau ini. Penglibatan APAFRI selaku rakan kongsi sebuah projek tajaan ITTO tentang sumber-sumber genetik telah diperkukuh dengan pelanjutan tempoh projek tersebut. APAFRI telah menganjurkan dua aktiviti utama iaitu satu bengkel latihan yang dihoskan oleh *Institute of Forest Genetics and Tree Breeding* di Coimbatore, India; dan satu acara sampingan dan pameran sempena Kongres Sedunia IUFRO XXIII pada tahun ini.

Kongres Sedunia IUFRO XXIII pada tahun ini telah diadakan dengan jayanya di Seoul, Korea dari 23–28 Ogos. APAFRI telah terlibat secara aktif dalam kongres-kongres sedunia IUFRO sejak penubuhannya pada 1995. Begitu juga pada tahun ini, APAFRI telah terlibat dalam beberapa aktiviti. Kakitangan sekretariat telah membantu Program Khas IUFRO bagi Negara-Negara Membangun (SPDC) melaksanakan empat bengkel latihan dengan dua modul latihan di *Forest Human Resources Development Institute, Namyangju City* (berhampiran Seoul), seminggu sebelum Kongres berlangsung. Sebagai satu aktiviti di bawah Projek ITTO tentang sumber-sumber genetik hutan, APAFRI menganjurkan satu acara sampingan tentang sumber-sumber genetik hutan Asia Pasifik serta menyediakan gerai pameran dan perdagangan yang mempamerkan poster dan mengedarkan pelbagai penerbitan semasa Kongres. Setiausaha Eksekutif turut bertindak sebagai pemudah cara dalam sesi subpleno dan satu sesi teknikal tentang sumber-sumber genetik hutan. Selain itu, APAFRI telah menaja penyertaan beberapa orang saintis muda dari rantau ini ke kongres sedunia ini dan diiktiraf sebagai penaja dalam Program Bantuan Saintis Kongres ini.

Tahun 2010 menandakan tahun ke-15 penubuhan APAFRI. Persatuan ini telah berkembang dalam banyak aspek. Pertubuhan ini bermula dengan kira-kira 12 ahli pada 1995, dan kini mempunyai lebih daripada 70 ahli yang terdiri daripada institusi dan individu. Sempena ulang tahun APAFRI ke-15, Sekretariat telah merealisasikan cadangan Pengerusi APAFRI sekarang, yang juga Ketua Pengarah FRIM, menerbitkan sebuah buku yang mengandungi kompilasi bergambar aktiviti dan pencapaian APAFRI sejak satu setengah abad yang lalu. Kompilasi bergambar ini menggambarkan (chronicled) penglibatan APAFRI dalam pelbagai aktiviti yang berkaitan perhutanan di rantau Asia dan Pasifik, serta

## The Asia Pacific Association of Forestry Research Institutions (APAFRI)



APAFRI has gone through another year with numerous sparkling achievements in 2010. Among the highlights are its highly prominent presence during the IUFRO World Congress 2010 in Seoul; successful completion of the ITTO Project on Forest Genetic Resources; training workshop in Coimbatore, India; and the Asia Pacific Symposium on Vulnerability Assessments in Manila, the Philippines.

The year 2010 was a rather significant year for many reasons. First and foremost, the United Nations proclaimed 2010 to be the International Year of Biodiversity, and various activities all over the world had been organized to increase the awareness to safeguard this irreplaceable natural wealth and reduce biodiversity loss. APAFRI, although not directly involved in related global activities, has nevertheless, contributed to some of the regional activities of relevance. APAFRI's involvement as a partner in an ITTO funded project on forest genetic resources was further strengthened with the project being granted another extension. Two major activities were organized, one a training workshop hosted by the Institute of Forest Genetics and Tree Breeding in Coimbatore, India; and a side-event and display at the XXIII IUFRO World Congress in August.

The XXIII IUFRO World Congress was successfully convened in Seoul, the Republic of Korea, from 23 to 28 August. APAFRI has been very active in past World Congresses since APAFRI's establishment in 1995. Likewise, for this year, APAFRI was involved in a number of activities. The Secretariat staff assisted IUFRO Special Programme for Developing Countries (SPDC) in conducting four training workshops with two training modules in the Forest Human Resources Development Institute, Namyangju City (near Seoul), the week before the congress. As an activity under the ITTO Project on Forest Genetic Resources, APAFRI organized a side event on Asia Pacific forest genetic resources as well as setting up a booth in the trade and exhibition displaying posters and distributing publications during the congress. The Executive Secretary also assisted in moderating a sub-plenary session and a technical session on forest genetic resources. In addition, APAFRI supported the participation of a number of young scientists from this region to the event and has been recognized as a sponsor in the Scientist Assistance Programme of the congress.

penyertaannya dalam pelbagai forum antarabangsa, selalunya sebagai mewakili rantau Asia dan Pasifik.

Sebelum ini APAFRI ditempatkan di sebuah pejabat yang luas dengan lima bilik, perubahan dalam struktur organisasi FRIM menyebabkan pejabat Sekretariat APAFRI terpaksa dipindahkan ke unit yang lebih kecil. Pihak pengurusan FRIM pada awal tahun ini mencadangkan dua unit kuarters FRIM diubahsuai untuk menempatkan Sekretariat APAFRI. Kos pengubahsuaian dua kuarters menjadi satu unit pejabat ditanggung oleh FRIM. Pengubahsuaian siap pada Julai, dan Sekretariat berpindah ke pejabat baharunya dan mula beroperasi sejak Ogos. Pada bulan Oktober, bangunan yang menempatkan Sekretariat APAFRI—Wisma APAFRI telah dirasmikan dalam satu majlis yang sederhana. Majlis turut diserikan dengan kehadiran salah seorang mantan Pengerusinya, Tan Sri Dr Salleh Mohd Nor, serta rakan-rakan dari *Bioversity International* dan FRIM.



Penerbitan pada 2010:

1. *Extended Abstracts from the International Symposium on Forest Genetic Resources*, 5–8 Oktober 2009, Kuala Lumpur.
2. *Extended Abstracts from the Asia and the Pacific Forest Products Workshop on Green Technology for Climate Change Mitigation and Adaptation*, 14–16 Disember 2009, Colombo, Sri Lanka

APAFRI sangat berterima kasih di atas sokongan yang tidak berbelah bahagi daripada pelbagai agensi berikut yang telah menyokong aktivitiinya sejak beberapa tahun (mengikut abjad):

- Australian Center for International Agricultural Research (ACIAR)
- Australian Department of Agriculture, Fisheries and Forestry (DAFF)
- Bioversity International (previously International Plant Genetic Resource Institute (IPGRI))
- Chinese Academy of Forestry (CAF)
- Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)
- Food and Agriculture Organization of United Nations (FAO)

The year 2010 marked the 15th year of existence of APAFRI. The association has grown in many respects. It started with about a dozen or so members way back in 1995, and today it has more than 70 institutional and individual members. To commemorate this 15th anniversary, the Secretariat, prompted by a suggestion from the current Chairman, also the Director General of FRIM, has published a pictorial compilation of APAFRI's activities and achievements over the past one-and-a-half decades. This pictorial compilation chronicled the involvements of APAFRI in numerous forestry related activities in the Asia and Pacific region, as well as its participations in various international forums often in the capacity as the Asia and Pacific representative.

Originally located in a very spacious five-room office unit, organizational structural changes in FRIM had necessitated the relocation of APAFRI Secretariat early last year to a smaller unit. FRIM's management had earlier in the year proposed renovating two units of vacant staff quarters to house the APAFRI Secretariat. The bulk of the costs for renovating the two adjoining staff quarters into a single office unit was borne by FRIM. The renovation was completed in July, and the Secretariat has moved in to this new office and started functioning since August. In October, the building housing the Secretariat of APAFRI—Wisma APAFRI—was officiated in a simple yet solemn ceremony. The occasion was graced by the presence of one of the past Chairmen, Tan Sri Dr Salleh Mohd Nor, as well as colleagues from Bioversity International and FRIM.



Publications during 2010:

1. *Extended Abstracts from the International Symposium on Forest Genetic Resources*, 5–8 October 2009, Kuala Lumpur.
2. *Extended Abstracts from the Asia and the Pacific Forest Products Workshop on Green Technology for Climate Change Mitigation and Adaptation*, 14–16 December 2009, Colombo, Sri Lanka.

APAFRI gratefully recognizes the generous support from the following agencies which have supported its activities over the years (in alphabetical order):

- ASEAN-Korean Environmental Collaboration Project (AKECOP)
- Australian Center for International Agricultural Research (ACIAR)

- Forest Research Institute Malaysia (FRIM)
- International Tropical Timber Organization (ITTO)
- Korean Government contribution through the
- International Union of Forestry Research Organizations (IUFRO)
- United States Department of Agriculture (USDA)— Forest Service
- Universiti Putra Malaysia (UPM)
- Australian Department of Agriculture, Fisheries and Forestry (DAFF)
- Bioversity International (previously International Plant Genetic Resources Institute (IPGRI))
- Chinese Academy of Forestry (CAF)
- Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)
- Food and Agriculture Organization of the United Nations (FAO)
- Forest Research Institute Malaysia (FRIM)
- International Tropical Timber Organization (ITTO)
- Korean Government contribution through the International Union of Forestry Research Organizations (IUFRO)
- United States Department of Agriculture (USDA) — Forest Service
- Universiti Putra Malaysia (UPM)

**AKTIVITI-AKTIVITI YANG DIANJURKAN/DISERTAI OLEH APAFRI  
ACTIVITIES ORGANIZED/PARTICIPATED BY APAFRI**

TARIKH/DATE	AKTIVITI/ACTIVITY	TEMPAT/VENUE
7–12 Mac/March	IUFRO Kuala Lumpur 2010 Conference on Sustainable Utilization and Conservation of Forest	Kuala Lumpur, Malaysia
22–25 Mac/March	Fourth International Casuarina Workshop	Haikou, China
8 Jun/June	APFISN Workshop on Pathways of Biological Invasion into Forests	Thimphu, Bhutan
9–11 Jun/June	APFC Twenty-third Session	Thimphu, Bhutan
5–9 Julai/July	Training Workshop on Conservation and Management of Forest Genetic Resources	Coimbatore, India
18–23 Julai/July	Second Analytical Workshop on Dynamics Plot Database Application and Tool Design	Kuala Lumpur, Malaysia
27–31 Julai/July	Training Course on Identification and Taxonomy of South- east Asian Fireflies	Kepong, Malaysia
16–20 Ogos/August	Pre-congress Workshops	Namyangju City, Korea
23–28 Ogos/August	XXIII IUFRO World Congress	Seoul, Korea
29 Ogos/August– 1 September	Regional Rattan Conference	Makati City, Philippines
23–26 November	International Conference on Forestry Education and Research for the Asia Pacific Region	Laguna, Philippines
7–9 Disember/December	Asia and the Pacific Symposium – Vulnerability Assessments to Natural and Anthropogenic Hazards	Manila, Philippines
14 Disember/December	Second Asia Pacific Forestry Sector Outlook Study (APFSOS II) – Launching of reports	Kuala Lumpur, Malaysia

## Persidangan Parti Konvensyen Kepelbagaian Biologi Kesepuluh

Persidangan Parti Konvensyen Kepelbagaian Biologi Kesepuluh telah berlangsung di Nagoya, Jepun dari 15–30 Oktober. Dr Saw Leng Guan dan Dr Pan Khang Aun dari Bahagian Biodiversiti Hutan, FRIM adalah antara dua anggota dalam delegasi Malaysia yang menghadiri persidangan tersebut. Dr Saw merupakan anggota yang membahaskan isu mengenai *Global Strategy for Plant Conservation (GSPC)*, *Global Taxonomy Initiative (GTI)* dan *Strategic Plan 2011–2020* manakala Dr Pan pula membahaskan isu *Clearing House Mechanism (CHM)* dan *Technology Transfer (TT)*. Dalam menyokong cadangan GSPC, Malaysia melaporkan pelaksanaan Flora Semenanjung Malaysia iaitu sebanyak 8300 spesies tumbuhan vaskular telah dikemas kini; misi dan sasaran harus dipermudah dengan tiada rintangan dan konsep yang susah difahami serta harus diiring dengan peruntukan kewangan yang tepat pada masanya kepada negara yang mempunyai sumber kepelbagaian biologi yang tinggi. Bagi CHM, rujukan telah dibuat mengenai pangkalan data biodiversiti negara yang boleh dicari dan laman sesawang *clearing house mechanism* yang ditempatkan di FRIM; untuk menghayati pemindahan teknologi yang terhad serta mekanisma kewangan yang tidak mencukupi dan tidak tepat pada waktunya sepertimana yang termaktub di dalam Artikel 16 Konvensyen tersebut seterusnya mencadangkan usaha yang gigih harus ditingkatkan untuk menjayakan *Biodiversity Technology Initiative*. Delegasi Malaysia telah memainkan peranan yang aktif dalam perbincangan berkaitan akses dan pengkongsian manfaat; telah dilantik sebagai jurucakap untuk *Like Minded Mega Diverse Countries (LMMDC)* dan juga dilantik sebagai jurucakap rantau Asia dan Pasifik dalam *Inter-Governmental Committee (IGC)*. Malaysia juga memainkan peranan yang amat penting dalam perbincangan Pelan Strategik 2011–2020 terutamanya dalam hala tuju, visi, misi dan sasaran mengenai nilai biodiversiti, kadar kehilangan habitat termasuk hutan, stok ikan dan pengurusan hutan secara lestari seterusnya berjaya mencerminkan kedudukan negara dan negara-negara yang sedang membangun di dalam teks pelan tersebut. Persidangan tersebut diakhiri dengan penerimaan *Nagoya-Kuala Lumpur Protocol on Liability and Redress for Damage Resulting from Living Modified Organisms*, *Aichi Nagoya Protocol on Access and Benefit Sharing*, dan *Aichi Nagoya Strategic Biodiversity Plan 2011–2020*.

## The 10Th Conference Of Parties (COP10) of The Convention on Biological Diversity (CBD)

The 10th Conference of Parties (COP10) of the Convention on Biological Diversity (CBD) was held in Nagoya, Japan from 15 to 30 October. Dr Saw Leng Guan and Dr Pan Khang Aun of the Forest Biodiversity Division, FRIM, were two members of the Malaysian Delegation attending COP10. Dr Saw was the focal person for issues pertaining to Global Strategy for Plant Conservation (GSPC), Global Taxonomy Initiative (GTI) and Strategic Plan 2011–2020 whilst Dr Pan handled the issues of Clearing House Mechanism (CHM) and Technology Transfer (TT). In supporting the recommendations of GSPC, Malaysia was reported to have initiated the Flora of Peninsular Malaysia where 8300 species of vascular plants were revised; mission and targets, it was stressed, must be made simple, not loaded with too many caveats and complicated concepts and timely financial resource allocations must be made available to nations with high biodiversity. For CHM, reference was made to the searchable national biodiversity database and clearing house mechanism website that is currently housed in FRIM; cognizance was taken of the limited transfer of technology (TT) and that with the inadequate predictable and timely financial mechanism, Article 16 of the Convention recommended more efforts be made to ensure the success of the Biodiversity Technology Initiative. The Malaysian delegation played a pivotal role in the access and benefit-sharing negotiations and one of the Malaysian delegates nominated as the spokesperson for the Like Minded Mega Diverse Countries (LMMDC) and later nominated as spokesperson for the Asia Pacific region in the Inter-Governmental Committee (IGC). Malaysia was also instrumental in the negotiation of the Strategic Plan 2011–2020 particularly concerning the purpose, vision, mission and targets for “biodiversity value, rate of loss of all natural habitats, including forests, fish stocks, and sustainable forest management” and managed to incorporate national concerns and those of the developing countries in the final texts. COP10 ended with the adoption of the Nagoya–Kuala Lumpur Protocol on Liability and Redress for Damage Resulting from Living Modified Organisms, Aichi Nagoya Protocol on Access and Benefit Sharing, and Aichi Nagoya Strategic Biodiversity Plan 2011–2020.



Dr Saw Leng Guan (kanan) dan Pn Zurinah Pawanteh dari NRE (kiri) merupakan antara wakil Malaysia di COP 10  
Dr Saw Leng Guan (right) and Mdm Zurinah Pawanteh from NRE (left) were among the representatives from Malaysia during the COP 10



(Kiri) Delegasi dari Malaysia, Ecuador dan Brazil sedang berbincang  
 (Kanan) Delegasi dari Malaysia sedang berbincang dengan Pengerusi WG 11, Luna  
 (Left) Delegates from Malaysia, Ecuador and Brazil in discussion  
 (Right) Malaysian delegates consulting with WG II Chairman, Luna  
 Sumber/Source: <http://www.iisd.ca/biodiv/cop10/27oct.html>

### Konvensyen Perdagangan Antarabangsa bagi Spesies Terancam Fauna dan Flora Liar

Perdagangan antarabangsa terhadap hidupan liar telah sekian lama merupakan aktiviti yang amat menguntungkan. Hasil yang diperdagangkan adalah pelbagai, iaitu melibatkan organisma hidup itu sendiri serta produk berasaskan hidupan liar. Usaha untuk mengawal aktiviti perdagangan ini terpaksa dilakukan bagi mengelakkan eksploitasi yang berterusan. Usaha ini memerlukan penglibatan dan kerjasama semua pihak di peringkat antarabangsa, dan CITES telah ditubuhkan bagi tujuan tersebut. Pada dasarnya, CITES telah mensasarkan supaya perdagangan antarabangsa yang melibatkan spesimen haiwan dan tumbuhan tidak akan memberi kesan buruk terhadap kemandirian spesies tersebut. Pada masa sekarang, sebanyak 34 086 spesies tumbuhan dan haiwan yang telah disenaraikan dalam tiga Lampiran mendapat perlindungan dan pengawasan oleh CITES. Lampiran 1 adalah untuk spesies yang mengalami kepupusan dan spesies ini hanya boleh diperdagangkan dalam kes-kes tertentu sahaja. Manakala Lampiran 2 untuk spesies yang tidak semestinya mengalami kepupusan, tetapi perdagangan spesies masih perlu dikawal untuk memastikan spesies itu terus kekal wujud. Lampiran 3 mengandungi senarai spesies yang dilindungi oleh sekurang-kurangnya sebuah negara, dan negara tersebut memerlukan bantuan untuk mengawal aktiviti perdagangan tersebut.

Bertindak sebagai suatu mekanisma pengaturcara, CITES menggariskan panduan pengawalan ke atas perdagangan antarabangsa spesimen di bawah lampirannya. Kesemua spesimen di dalam Lampiran sama ada import, eksport, eksport semula dan diperkenalkan daripada laut hendaklah melalui sistem pelesenan yang disahkan. Setiap negara perlu menubuhkan satu atau lebih pihak Berkuasa Pengurusan untuk menguruskan sistem pelesenan dan operasi CITES serta mempunyai satu atau lebih pihak Berkuasa Saintifik sebagai penasihat dalam kesan perdagangan ke atas kemandirian spesies.

Program kerja CITES ditadbir melalui tiga jawatankuasa iaitu *Standing Committee*, *Plants Committee* dan *Animals Committee*. Jalinan usahasama CITES dengan organisasi lain seperti CBD, FAO dan ITTO juga telah diwujudkan. CITES

### Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

Annual global wildlife trade has long been recognized as being extremely lucrative and the parts and derivatives traded are diverse, ranging from live organisms to a vast array of wildlife products derived therein. The effort to regulate trade arises from the necessity to safeguard species from overexploitation. To do this requires regional and international cooperation and CITES was established to provide such means. Essentially, CITES aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Today, the Convention accords varying degrees of control and protection to some 34 086 species of animals and plants, through the listing in three Appendices. Appendix I includes species threatened with extinction and trade in these species is permitted only in exceptional circumstances. Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled to ensure sustainability. Appendix III contains species that are protected in at least one country, which has requested Parties for assistance in controlling trade.

As a regulatory mechanism, CITES subjects international trade in specimens of the Appendices to certain controls. All imports, exports, re-exports and introductions from the sea of specimens in the Appendices are authorized through a licensing system. Each Party must designate one or more Management Authorities to administer the licensing system and the operations of the Convention and one or more Scientific Authorities to advise on the effects of trade on species survival.

The CITES work programme is administrated through three committees, i.e. Standing Committee, Plants and Animals Committees. In addition, CITES establishes cooperation with other organizations such as CBD, FAO and ITTO. CITES conducts frequent reviews of the Appendices, annotations to the Appendices, reviews of significant trade, compliance and enforcement efforts, issues on trade control and marking of specimens introduced from the sea, ranching specimens, production systems and codes used in CITES permits and certificates. In addition, CITES deliberates on exemptions

menjalankan ulasan terhadap Lampiran, anotasi Lampiran, meninjau kembali kepada perdagangan yang penting, usaha pelaksanaan dan penguatkuasaan, isu pengawalan perdagangan dan penandaan spesimen yang diperkenalkan daripada laut, penternakan spesimen, sistem pembuatan dan kod yang diguna pakai untuk permit dan sijil CITES. Selain itu, CITES akan mempertimbangkan untuk pengecualian bagi perdagangan khas. Sebahagian besar komponen CITES menjuruskan kepada pembangunan kapasiti dalam bidang seperti *Non-detriment findings* (NDF) dan penguatkuasaan.

Di Malaysia, Pihak Berkuasa Pengurusan diketuai oleh Kementerian Sumber Asli dan Alam Sekitar (NRE). FRIM telah ditugaskan sebagai Pihak Berkuasa Saintifik. FRIM akan memberi bantuan teknikal dalam membuat keputusan bagi spesies tumbuhan yang tertakluk di bawah CITES. Tugas utama ialah menyediakan bukti secara saintifik yang menunjukkan bahawa perdagangan yang melibatkan spesimen tumbuhan tidak akan memberi kesan buruk terhadap kemandirian berterusan spesies tersebut, serta memberi cadangan langkah-langkah yang boleh diambil bagi mengurangkan kesan buruk terhadap spesies yang terlibat dalam aktiviti perdagangan itu. Selain itu, FRIM juga terlibat dengan aktif melalui NRE di dalam *Conference of the Parties* (COP), *Plants Committee* dan pelbagai kumpulan kerja. Pada bulan November 2008, FRIM telah dijemput untuk turut serta dalam *Expert Workshop on CITES NDF* yang diadakan di Mexico. NDF merupakan elemen penting di dalam CITES, di mana kajian dijalankan bagi menentukan sama ada sesuatu eksport itu akan menjejaskan kemandirian spesies tersebut.

### **Sekretariat Perhutanan *Clean Development Mechanism* (CDM)**

Tahun 2010 menandakan kejayaan Sekretariat Perhutanan CDM memperoleh projek perundingan bertajuk “Quantification of carbon stocks, sequestration rate and trial values at PETRONAS existing assets” yang dijadualkan selama dua tahun, antara pertengahan tahun 2010 dan pertengahan tahun 2012 (FRIM UP19/2010). Projek ini dijalankan dengan kerjasama Program Perubahan Iklim dan Program Hutan Asli, FRIM memandangkan penjawat awam yang terlibat sebahagian besarnya adalah dari kedua-dua Program tersebut.

Projek ini bertujuan untuk menilai lima aset Petroleum Nasional Berhad (PETRONAS), yang mengandungi dua kawasan hutan di Universiti Teknologi PETRONAS (UTP) di Perak dan *Kertih Observatory Tower* di Terengganu, dan tiga kawasan bandar di *Kuala Lumpur City Centre* (KLCC), Melaka dan Bangi, Selangor. Bagi dua kawasan hutan, iaitu UTP dan *Kertih Observatory Tower*, nilai dirian balak dan kadar pelepasan karbon juga akan turut dinilai.

Dari perspektif Sekretariat CDM, projek ini akan membantu inisiatif pemuliharaan biodiversiti PETRONAS memandangkan sumber balak di dua kawasan hutan yang dinyatakan tidak ditebang tetapi dipelihara. Kadar pelepasan karbon merupakan salah satu parameter yang akan dibuat anggaran oleh kumpulan penyelidik ini. Langkah yang diambil oleh PETRONAS dilihat sebagai pelopor pengiktirafan sektor swasta tentang kepentingan untuk memulihara hutan sebagai

and special trade provisions. A large component of CITES addresses capacity building in areas such as Non-detriment findings (NDF) and enforcement.

The Lead Management Authority in Malaysia is the Ministry of Natural Resources and Environment (NRE). FRIM is appointed as a Scientific Authority and, in this capacity, provides technical support to decision-making of plant species that are subjected to CITES controls. FRIM's primary role is to provide scientific evidence that trade in the specimens does not threaten species survival and sustainability and to recommend measures that may alleviate species loss through trade activities. In addition, FRIM actively participates, through the NRE, in the Conference of the Parties, the Plants Committee and working groups. In November 2008, FRIM was invited to participate in the International Expert Workshop on CITES NDF which was held in Mexico. NDF is a crucial element in CITES where studies to determine whether a particular export will be detrimental to the survival of a species are conducted.

### **Clean Development Mechanism (CDM) Forestry Secretariat**

The year 2010 marked the success of the CDM Forestry Secretariat in securing a consultancy project entitled “Quantification of Carbon Stocks, Sequestration Rate and Trial Values at PETRONAS Existing Assets” scheduled for two years, between mid-2010 and mid-2012 (FRIM UP19/2010). The project is being conducted jointly with the Climate Change and Natural Forests Programmes, as the staff involved in the inventory exercises come mainly from these two programmes.

The project is intended to evaluate five assets of the Petroleum Nasional Berhad (PETRONAS), which include two forested areas in Universiti Teknologi PETRONAS (UTP) in Perak and *Kertih Observatory Tower* in Terengganu, and three urban areas in Kuala Lumpur City Centre (KLCC), Melaka and Bangi, Selangor. For the two forested areas, i.e., UTP and *Kertih Observatory Tower*, the values of standing timber and rate of carbon sequestration will also be calculated.

From the perspective of the CDM Secretariat, the project will assist PETRONAS's biodiversity conservation initiatives as timber resources at the two forested areas mentioned above are not harvested but rather conserved. Carbon sequestration rate is one of the parameters to be estimated by the research team. Above all, the step taken by PETRONAS is seen as a pioneer effort towards the private sector's recognition of the importance of conserving forests as carbon stock and sequestering of carbon in the Peninsula.

Besides being proactive in promoting its own activities, the CDM Forestry Secretariat based at FRIM also is a member of the National Committee on the Clean Development Mechanism (NCCDM). The NCCDM is chaired by the Ministry of Natural Resources and Environment. The NCCDM, which meets not less than four times per year, is responsible for making the first assessment based on the project idea note (PIN). Once they are satisfied with the PIN, project proponents will be asked to prepare a full project document for the second assessment. Eligible projects will then be recommended to the Executive Board of the United Nations Framework Convention on Climate Change (UNFCCC) for approval.

stok karbon dan pelepasan karbon di Semenanjung.

Selain bertindak proaktif dalam mempromosi aktiviti-aktivitinya, Sekretariat Perhutanan CDM yang ditempatkan di FRIM juga merupakan Ahli Jawatankuasa Kebangsaan tentang *Clean Development Mechanism* (NCCDM). NCCDM yang dipengerusikan oleh Kementerian Sumber Asli dan Alam Sekitar bermesyuarat tidak kurang daripada empat kali setahun, bertanggungjawab membuat penilaian pertama berdasarkan nota idea projek (PIN). Apabila berpuas hati dengan PIN, project proponents akan diminta untuk menyediakan dokumen penuh projek untuk penilaian kedua. Projek-projek yang layak akan disyorkan kepada Lembaga Eksekutif bagi *United Nations Framework Convention on Climate Change* (UNFCCC) untuk kelulusan.

Mesyuarat-mesyuarat jawatankuasa biasanya dihadiri oleh ketua-ketua sekretariat di bawah NCCDM, termasuk FRIM, Perbadanan Teknologi Hijau Malaysia, dan Institut Penyelidikan dan Pembangunan Pertanian Malaysia (MARDI). NCCDM juga mempunyai ahli dari organisasi bukan kerajaan, di samping wakil-wakil dari agensi dan jabatan kerajaan yang lain. Sehingga kini, 87 projek CDM dari Malaysia telah diluluskan oleh Lembaga Eksekutif UNFCCC, yang sebahagian besarnya ialah berasaskan tenaga. Pada 2010, sembilan projek CDM telah disokong oleh NCCDM dan diluluskan oleh Lembaga Eksekutif NCCDM.

Committee meetings usually are attended by the heads of all the secretariats under the NCCDM, which include FRIM, Malaysia Green Technology Corporation, and the Malaysian Agricultural Research & Development Institute (MARDI). The NCCDM also has members from nongovernmental organizations, as well as representatives from other government agencies and departments. To date, 87 CDM projects from Malaysia have been approved by the Executive Board of the UNFCCC, which are mainly energy based. In 2010, nine CDM projects were recommended by the NCCDM and approved by the Executive Board of the NCCDM.

**PROJEK CDM BERDAFTAR DENGAN LEMBAGA EKSEKUTIF UNFCCC 2010**  
**CDM PROJECTS REGISTERED WITH THE EXECUTIVE BOARD OF THE UNFCCC, 2010**

BIL. NO.	TARIKH PENDAFTARAN DENGAN EB/DATE OF REGISTRATION AT EB	TAJUK/TITLE	TUAN RUMAH HOST PARTY	PIHAK LAIN OTHER PARTIES	SKOP SEKTOR SECTORAL SCOPE
1	29 Disember/ December	KDC Mill 1 and Mill 2 Biogas Project	Malaysia	United Kingdom and Northern Ireland	Energy industries (renewable/ non-renewable sources) Waste handling and disposal
2	8 Oktober/ October	Sungei Kahang POME Biogas Recovery for Energy Project in Johor, Malaysia	Malaysia	Japan	Waste handling and disposal
3	8 Oktober/ October	Tian Siang Co-composting Project	Malaysia	United Kingdom and Northern Ireland	Waste handling and disposal
4	2 Oktober/ October	Solids separation of POME and Co-composting project, Sabah	Malaysia	Switzerland	Waste handling and disposal
5	21 Jun/June	Sunquest Biomass Renewable Energy Project	Malaysia	United Kingdom and Northern Ireland	Energy Industries (renewable/ non-renewable sources) Waste handling and disposal
6	15 Jun/June	Filmax Biomass Thermal Energy Project	Malaysia	United Kingdom and Northern Ireland	Energy Industries (renewable/ non-renewable sources)
7	17 Mac/March	Kunak Bio Energy Project	Malaysia	United Kingdom and Northern Ireland	Energy Industries (renewable/ non-renewable sources)
8	2 Februari/ February	Inno-Kwants Mewah- Palm Oil Mill Waste Recycle Scheme, Malaysia	Malaysia	United Kingdom and Northern Ireland	Waste handling and disposal
9	5 Januari/January	Golden Hope Composting Project-Pekaka	Malaysia	Denmark	Waste handling and disposal

Sumber/Source: *United Nations Forestry Convention on Climate Change (UNFCCC)*.  
Website address: <http://cdm.unfccc.int/>

## SISTEM PENGURUSAN KUALITI THE QUALITY MANAGEMENT SYSTEM

Sistem Pengurusan Kualiti FRIM terus dilaksanakan pada tahun 2010 dengan tambahan satu lagi pensijilan yang baharu iaitu Pensijilan 5S. Pensijilan 5S ini adalah sejajar dengan matlamat NRE bagi memperoleh pensijilan bagi keseluruhan agensi dan jabatan di bawahnya pada tahun 2010. Oleh itu FRIM telah melaksanakan aktiviti kualiti yang berkaitan serta menyertai pertandingan yang dianjurkan oleh NRE di sepanjang 2010.

### Pelaksanaan Audit Dalam

FRIM hanya melaksanakan satu kali sahaja sesi audit pada tahun ini. Namun pada tahun ini selain audit MS ISO 9001:2008 dan MS ISO/IEC 17025 (bagi makmal ujian), pelaksanaan audit 5S juga dilaksanakan serentak. Audit Dalam bertujuan untuk memastikan kepatuhan kepada standard, peraturan, kriteria dan lain-lain keperluan yang telah ditetapkan dan sistem pengurusan kualiti bagi memenuhi kepuasan pelanggan FRIM.

### Audit Dalam MS ISO 9001:2008

Jumlah penemuan bagi siri 1/2010 telah meningkat sebanyak 16.3%. Didapati kenaikan ini adalah kerana audit dalam yang hanya dilaksanakan sekali sahaja menyebabkan sikap sambil lewa di kalangan penjawat awam dalam pengurusan sistem kualiti. Oleh itu pada tahun 2011, audit dalam akan dilaksanakan dua kali setahun.

The Quality Management System continued to be implemented in 2010 with new added certification, i.e. the 5S certification. The 5S certification has been applied in order to fulfill the NRE's mission to get the certification for all agencies concurrently in 2010. Therefore FRIM was involved in all quality activities and competitions organized by the NRE in 2010.

### Internal Audit Implementation

Only one internal audit session was implemented in 2010. The internal audit for 5S was conducted concurrently with MS ISO 9001:2008 and MS ISO/IEC 17025 (for testing laboratories). The objective of the internal audit was to ensure processes were implemented in accordance with the requirements of the quality standards, regulations, criteria, as well as other requirement of the quality management system in order to fulfill clients' needs.

### Internal Audit MS ISO 9001:2008

Overall findings increased by 16.3% compared to Series 1/09. The reason for the increment was that because the internal audit which was held only once in 2010, staff who did not seriously practice the quality management system. As corrective action, the internal audit will be conducted twice in 2011.



Audit Dalam MS ISO 9001 di Cawangan Teknologi Maklumat  
Internal Audit MS ISO 9001 at the Information Communication Technology Branch

### Audit Dalam MS ISO/IEC 17025

Audit dalam ini telah dilaksanakan ke atas 10 cawangan, unit, makmal, bengkel and stesen penyelidikan (CUMBS) di Bahagian Keluaran Hutan, tiga CUMBS di Bahagian Tumbuhan Ubatan dan satu CUMBS di Bahagian Bioteknologi Perhutanan. Secara keseluruhan tiada penemuan utama pada kali ini dan jumlah penemuan telah menurun sebanyak 2.6%. Ini menunjukkan makmal-makmal ujian sedang giat membuat penambahbaikan sama ada bagi mengekalkan mahupun memperoleh akreditasi MS ISO/IEC 17025 (bagi 10 makmal yang lain).

### Internal Audit MS ISO/IEC 17025

Internal audit was conducted at 10 branches, units, laboratories, workshops and research stations or the *cawangan, unit, makmal, bengkel and stesen penyelidikan* (CUMBS) under the Forest Products Division, three CUMBS under the Medicinal Plants Division and one CUMBS under the Forest Biotechnology Division. Overall, there was no major findings and findings decreased by 2.6% compared with 1/09 series. This shows that the testing laboratories were seriously implementing the quality system in order to maintain or to obtain (other 10 laboratories) MS ISO/IEC 17025 accreditation.



Audit Dalam 5S/QE di Makmal Analisis Awetan Kayu  
5S/QE Internal Audit at the Wood Preservative Analysis Lab

### Audit Dalam 5S/QE (Persekitaran Berkualiti)

Audit dalam 5S/QE telah dilaksanakan sebanyak tiga kali pada tahun 2010 iaitu pada 10–21 Mei (Siri 1/2010), 15 Julai (Siri 2/2010) dan 27 Oktober. Sebanyak 12 Zon telah terlibat dalam pelaksanaan 5S fasa pertama ini. Hasil audit menunjukkan peningkatan dalam semua kriteria yang melibatkan keperluan utama, keperluan gunasama, keperluan individu, keperluan tempat simpanan, keperluan umum dan keperluan persekitaran.

### Internal Audit 5S/QE (Quality Environment)

5S/QE internal audit was conducted thrice in 2010, on 10–21 May, 15 July and 27 October. There were 12 zones involved in the first phase of 5S implementation. The audit results showed good improvement for all criteria in the main needs, sharing needs, individual needs, storage needs, general needs and environment needs.



Audit Dalam 5S/QE di Unit Pengurusan Kualiti  
5S/QE Internal Audit at the Quality Management Unit

Audit pensijilan semula telah dilaksanakan bagi memastikan kepatuhan kepada standard MS ISO 9001:2008 serta dokumen yang berkaitan dan mengekalkan pensijilan MS ISO 9001:2008. Pada tahun 2010 Badan Pensijilan yang baharu iaitu MOODY International Sdn Bhd telah dilantik untuk melaksanakan audit tersebut. Audit pemantauan MS ISO/IEC 17025 telah dilaksanakan ke atas empat makmal ujian yang sedia ada, manakala Audit Pematuhan telah dilaksanakan di enam makmal baharu di Bahagian Keluaran Hutan sebagai memenuhi sebahagian daripada keperluan untuk mendapat akreditasi MS ISO/IEC 17025.

A re-certification audit has been implemented to evaluate FRIM's conformance with the requirements of MS ISO 9001:2008 including related documents and maintenance of the certification. In 2010 a new certification body, MOODY International Sdn Bhd, was appointed to conduct the external audit. In order to maintain MS ISO/IEC accreditation, surveillance and re-assessment audits were conducted by the Department of Standards of the existing six laboratories. Compliance Audit has been conducted for the six new laboratories under the Forest Products Division so as to fulfill part of the requirements to obtain accreditation in accordance with the MS ISO/IEC 17025 standard.



Juruaudit dari MOODY International  
Auditors from MOODY International



Juruaudit dari Jabatan Standard Malaysia  
Auditors from the Department of Standards Malaysia



Mesyuarat Pembukaan Audit MS ISO/IEC 17025 CPK  
Audit Opening Meeting for MS ISO/IEC Audit CPK



Audit MS ISO 9001:2008 di Makmal Kultur Tisu  
MS ISO 9001:2008 Audit at the Tissue Culture Laboratory



Juruaudit NRE melaksanakan audit di Cawangan Pentadbiran/  
Auditor from the NRE audited the Administration Branch



Juruaudit MPC melaksanakan audit di Pusat Teknologi Herba/  
Auditor from the MPC conducted audit at the Herbal  
Technology Centre

## Laporan Pelaksanaan audit 5S/QE daripada NRE dan MPC

Sebanyak dua siri audit telah dilaksanakan oleh NRE dan dua lagi siri audit dilaksanakan oleh Perbadanan Produktiviti Malaysia (MPC) bagi memastikan FRIM berjaya memperoleh sijil 5S bersama-sama dengan jabatan dan agensi lain di bawah NRE. Hasil daripada audit yang dilaksanakan oleh MPC pada 19 Julai, FRIM telah melepasi audit tersebut dan berjaya memperoleh pensijilan 5S MPC.

Two audit series were conducted by the NRE and another two by the Malaysian Productivity Corporation (MPC) in order to ensure FRIM was certified with 5S certification together with other agencies under the NRE. FRIM successfully went through the audit and on 19 July FRIM received the 5S certification.

### 1 Latihan Kualiti 2009

Sebanyak sembilan latihan yang menggabungkan keperluan kualiti dan teknikal telah diadakan di sepanjang tahun 2010 merujuk ringkasan maklumat seperti jadual di bawah:

### 1 Quality Training

A total of nine training courses, which combined quality and technical requirements, were conducted for the year 2010. The list of training courses is given below:

#### LATIHAN KUALITI /QUALITY TRAINING

BIL/NO	NAMA LATIHAN /DESCRIPTION	TARIKH /DATE
1	Latihan Self Audit CUMBS/Self Audit Training for CUMBS	23–24 Februari/ February
2	Latihan Pengendalian dan Penulisan Minit QMR CUMBS/Handling and Writing of QMR Minutes for CUMBS	10–11 Mac/March
3	Bengkel Ketidaktetapan Pengukuran/Workshop on Measurement Uncertainty	30 Mac/March
4	Latihan Audit Dalam 5S/5S Internal Audit Training	1–2 April
5	Latihan Penyelaras 5S/5S Coordinator Training	19–20 April
6	Latihan Pelaksanaan Prosedur Kualiti Wajib/Training on Compulsory Quality Procedure Implementation	26–29 April
7	Latihan Pengukuhan Juruaudit Dalam MS ISO 9001 & MS ISO/IEC 17025 Strengthening Internal Auditor Training for MS ISO 9001 & MS ISO/IEC 17025	3–4 Mei/May
8	Latihan Ketidaktetapan Pengukuran Untuk Ujian Fizikal dan Mekanikal Measurement of Uncertainty for Physical and Mechanical Testing	5–6 Mei/May
9	Latihan Ketidaktetapan Pengukuran Untuk Ujian Biologi (Latihan Pendek) Measurement of Uncertainty for Biological Testing (Short Training)	4 Jun/June



Para peserta Latihan Penyelaras Audit 5S  
Participants of 5S Audit Coordinators Training



Latihan Pelaksanaan Prosedur Kualiti Wajib  
Training on Compulsory Quality Procedure Implementation

### 2 Dokumen Kualiti FRIM/

Pada tahun ini beberapa pindaan telah dilaksanakan ke atas dokumen kualiti FRIM dan juga lapan prosedur kualiti baharu diwujudkan bagi memantapkan lagi sistem pengurusan kualiti FRIM. Antaranya ialah Prosedur Pengurusan Penyelidikan dan Prosedur Pengendalian Khidmat Sewaan (Peralatan dan Ruang).

### 2 FRIM Quality Document

Amendments were made to the FRIM quality documents and eight new quality procedures have been established in order to strengthen the quality management system in FRIM. Among others were the Research Management Procedure and the Handling of Rentals Services Procedure (Equipment and Space).

## Bulan Inovasi

Bulan inovasi FRIM telah dilaksanakan di sepanjang bulan Oktober dan November. Dengan slogan "Inovasi Tempatan, Aplikasi Serantau, Pengiktirafan Global", pelbagai pertandingan berkaitan kualiti dan inovasi telah dilaksanakan. Kemuncak acara ialah Hari Inovasi yang telah dilaksanakan pada 1 Disember di FRIM yang melibatkan pameran, ceramah dan pertandingan KIK (Kumpulan Inovatif dan Kreatif) serta Inovasi telah berlangsung dengan jayanya.



Peserta pertandingan Inovasi / Contestants of Innovation Competition



Pemenang Pingat Emas / Gold Medal Winner



Pemenang Anugerah Persekitaran Kerja Terbaik/Good Environmental Workplace Winner

## Innovation Month

FRIM Innovation Month was held in October and November. With the slogan of "Local Innovation, Regional Application, Global Recognition", many quality and innovation competitions were organized. Innovation Day was held on 1 December at FRIM as a closing event. Activities such as an exhibition, talks and KIK (Innovative and Creative) and an Innovation Competition were successfully organized.

## Hari Inovasi NRE 2010

FRIM telah menyertai pertandingan-pertandingan yang dianjurkan oleh NRE sempena sambutan Hari Inovasi NRE pada 9 & 10 November. FRIM telah menjadi johan bagi tiga pertandingan dan Tempat Kedua bagi dua pertandingan. Pencapaian FRIM adalah seperti berikut:

- Tempat Pertama: Pertandingan Hiasan dan Pameran Terbaik
- Tempat Pertama: Anugerah 5S Peringkat Jabatan/Agensi
- Tempat Pertama: Anugerah Peneraju Kualiti Peringkat Jabatan/Agensi
- Tempat Kedua: Pertandingan Penjimatan Tenaga (Mempunyai Bil Utiliti)
- Tempat Kedua: Himpunan Lagu-Lagu Dakwah

## NRE Innovation Day 2010

FRIM participated in the competition organized by the NRE for the NRE Innovation Day on 9 and 10 November. FRIM was champion in three competitions and was first runner-up in two. The results were:

- First Place: Best Exhibition Award
- First Place: 5S Award at Department/Agency Level
- First Place: Quality Leader Award at Department/Agency Level
- Second Place: Energy Saving Competition (with Utility Bills)
- Second Place: Dakwah Songs Collection



Dr Abd Rahim Nik menerima trofi kemenangan  
Dr Abd Rahim Nik receiving the winning trophy

## PETUNJUK PRESTASI UTAMA KEY PERFORMANCE INDICATORS

PENCAPAIAN	2009	2010
Projek Penyelidikan/Research projects	184	181
ScienceFund MOSTI 1		
ScienceFund MOA 17		
TPIKM (KPPK) 2		
Lain-lain/Others 161		
Dana Penyelidikan/Research fund (RM juta/million)	26.5	31.1
• ScienceFund MOSTI: RM271 900		
• ScienceFund MOA: RM2.52		
• TPIKM (KPPK): RM2.71		
• Lain-lain/Others: RM25.59		
Penghasilan kertas teknikal & saintifik termasuk jurnal/Technical & scientific papers including journals	537	420
Penerbitan (Teknikal/bukan teknikal)/Publications (Technical/non-technical)	217	151
Bilangan memorandum persefahaman/perjanjian bagi projek penyelidikan dengan agensi luar/No. of MoU/agreements for research projects with external agencies	20	
<b>PROMOSI /PROMOTIONS</b>		
Penyertaan pameran/Exhibitions	23	22
Penghasilan artikel/rencana media/ Articles/features in media	82	126
Penganjuran seminar/persidangan/bengkel/dialog Seminars/conferences/workshops/dialogues organized	44	35
<b>AKTIVITI KOMERSIALISASI/COMMERCIALIZATION ACTIVITIES</b>		
Hasil/Output Penyelidikan Research Findings/Outputs	19	18
Menandatangani lesen trademark/Trademark licensing	11	3
Pendedahan Reka cipta/ Invention disclosure	20	15
Pengiktirafan Paten/Patent recognition	2	1
Pemfailan Paten/Patent filing	4	18
<b>PERKHIDMATAN/SERVICES</b>		
Ujian dan perkhidmatan/Testing and services (RM)	849 454	727 967
Perundingan ikhtisas/Professional consultancies	42	39
Pelawat Rasmi/Official visitors	60 500	198 066
Pendapatan - Sewaan peralatan, ruang & penjualan bahan (RM) Income-Rentals of equipment, space & sales of materials	692 000	823 453
<b>LATIHAN/TRAINING</b>		
Menganjurkan latihan dalaman/luaran mengikut kepakaran Organizing internal/external trainings according to experties	37	207

## Liputan Media/Publisiti

Unit Pengurusan Korporat telah melaksanakan beberapa aktiviti untuk berkenalan serta memupuk silaturahmi dengan pengamal media pada tahun 2010, seperti yang disenaraikan di bawah:

## Media Coverage/Publicity

The Corporate Management Unit undertook various activities to establish contacts and strengthen the relationship between FRIM and the media, as listed below:

BIL. NO.	AKTIVITI ACTIVITY	TARIKH DATE
1	<p><b>Lawatan pegawai media ke Ibu Pejabat/</b> Media officer's visits to:</p> <ul style="list-style-type: none"> <li>• Utusan Malaysia dan Kosmo</li> <li>• New Straits Times, Berita Harian dan Harian Metro</li> <li>• The Star dan The Sun.</li> </ul>	<p>27 Januari/January 28 Januari/January 10 Februari/February</p>
2	<p><b>Media outing di FRIM</b> untuk 16 peserta termasuk wartawan dari Kyodo KL, New Straits Times, The Star, Utusan Malaysia dan Malay Mail.</p> <p>Media outing at FRIM with 16 participants including journalists from Kyodo KL, New Straits Times, The Star, Utusan Malaysia and the Malay Mail.</p>	10 April
3	<p><b>Kursus "Memahami Media"</b></p> <p><i>Penceramah jemputan:</i> Datuk Mohd Zaini Hassan, Penolong Ketua Pengarang Utusan Malaysia; En Hemanathan Paul, Pengurus Produksi Primeworks dan Cik Liew Suet Fun Perunding PR/ Penulis.</p> <p><i>Objektif utama kursus:</i></p> <ul style="list-style-type: none"> <li>• Meningkatkan pengetahuan terhadap cara-cara terbaik untuk mendapatkan liputan media dan berurusan dengan pihak media.</li> <li>• Mempertingkatkan kapasiti untuk memberi maklumat yang bersesuaian serta menarik bagi media.</li> <li>• Memberi peluang kepada para peserta untuk berinteraksi dengan pengarang/penulis/penerbit jemputan, serta menyediakan platform bagi CCU untuk mengeratkan lagi hubungan FRIM dengan media.</li> </ul> <p>Bengkel disertai oleh 15 pegawai penyelidik dan pegawai khidmat sokongan yang perlu berurusan dengan pihak media terutamanya mereka aktif terlibat dalam jawatankuasa pengendalian konferens, seminar, bengkel serta program-program yang melibatkan orang awam.</p> <p><b>Training on "Understanding the Media"</b></p> <p><i>Invited speakers:</i> Datuk Mohd Zaini Hassan, Utusan Malaysia Assistant Editor-in-Chief; Mr Hemanathan Paul, Production Manager of Primeworks; and PR Consultant/Writer Ms Liew Suet Fun.</p> <p><i>The main objectives:</i></p> <ul style="list-style-type: none"> <li>• To enhance knowledge of the effective ways in dealing with the press and ensuring media coverage.</li> <li>• To enhance the participants' capacity to cater to the needs of the media by providing the information required.</li> <li>• To provide participants with the opportunity to interact with media practitioners, and to provide a platform for the Corporate Management Unit to help enhance the relationship between FRIM and the media.</li> </ul> <p>The workshop was attended by 15 research officers and support staff dealing with the media, particularly those actively involved in organizing conferences, seminars, workshops and programmes involving the public.</p>	20 Julai / July



Susunan imej beberapa keratan akhbar utama  
Image of some of the main newspaper cuttings in juxtaposition

Berita terpilih dan artikel rencana/laporan yang mengandungi maklumat yang padat dan tepat mengenai FRIM dari media cetak atau siaran berjumlah 226 dengan anggaran nilai PR: RM 6.6 juta. Jika dikira jumlah petikan akhbar yang ada menyebut nama FRIM termasuk oleh agensi lain yang menyebut nama FRIM dalam usahasama atau melaksanakan aktiviti di FRIM misalnya, jumlahnya meningkat kepada 326, dengan nilai PR berjumlah RM7 juta. Jumlah ini ialah berita yang dimuat turun ke dalam "FRIM in News" di laman web FRIM. Agensi lain atau orang perseorangan yang menyebut FRIM membantu usaha mereka turut dikira kerana membawa nilai positif walaupun keseluruhan artikel itu bukan tentang FRIM.

Daripada jumlah artikel dan laporan; media cetak berjumlah 77% manakala radio (15%) dan televisyen (8%). Terdapat paling banyak artikel/laporan berkenaan FRIM dalam Bahasa Inggeris (44%), Bahasa Melayu (28%) dan Bahasa Cina (28%). Akhbar yang paling banyak membuat liputan tentang FRIM ialah The Star (12%); Nanyang Siang Pau (11.2%); Utusan Malaysia (8.38%); Sinar Harian (8.38%); New Straits Times (7.3%) dan Sin Chew Daily (7.3%).

Perubahan yang paling ketara pada tahun 2010 ialah peningkatan petikan berita dari akhbar Bahasa Cina. Ini merupakan hasil daripada strategi FRIM menghantar jemputan media dan hebahan media dalam bahasa tersebut.

FRIM banyak mengadakan aktiviti di sepanjang 2010 dan aktiviti-aktiviti ini merupakan sumber publisiti yang diterima oleh FRIM di sepanjang tahun. Daripada jumlah RM6.6 juta, hampir RM4.8 juta nilai PR diperoleh daripada pelaksanaan aktiviti/acara tersebut. Sebanyak 13 aktiviti utama telah menarik minat pihak media dan acara yang mendapat publisiti yang terbanyak adalah seperti berikut:

The number of news and feature articles/reports containing substantial information about FRIM from the print and broadcast media totalled 226 with an estimated PR value of RM6.6 million. If newspaper articles/reports of joint activities/programmes with other partners are taken into account, there were 326 items which were uploaded to "FRIM in News" on the website. The number included articles/reports related to activities conducted by other agencies, about other organizations or individuals which mentioned FRIM's involvement in a positive light.

Of the total items, print media produced 77% of them, followed by radio (15%) and television (8%). Most of them were in English (44%), while bahasa Malaysia and Mandarin each made up 28%. The newspapers which published the most articles on FRIM was The Star (12%), followed by Nanyang Siang Pau (11.2%), Utusan Malaysia and Sinar Harian (8.38% respectively), and New Straits Times and Sin Chew Daily (7.3% respectively). The most obvious change from 2009 to 2010 was the increased number of news and feature reports in the Chinese newspapers. This may be the result of FRIM's strategy to send out more translated press invitations and media releases.

Most of the media coverage resulted from the activities and events organized by FRIM throughout the year, generating RM4.8 million in PR value out of the RM6.6 million. There were 13 major activities/events in 2010 that attracted huge media coverage and the following garnered the most publicity:

1. Second International Firefly Symposium—2 August
2. International Symposium on Forestry & Forest Products—5–7 October
3. Perasmian FRIM sebagai Tapak Warisan Semula Jadi—18 November

1. Second International Firefly Symposium – 2 Ogos
2. International Symposium on Forestry & Forest Products – 5-7 October
3. Perasmian FRIM sebagai Tapak Warisan Semula Jadi– 18 November
4. Hari Perhutanan Sedunia – 21 Mac
5. Green Cycle – 6 June.

Daripada jumlah laporan/artikel yang terpilih, 44 artikel rencana memaparkan tentang penyelidikan dan penyelidikan yang dijalankan oleh FRIM; dan lebih daripada 20 pegawai FRIM telah diberi ruang untuk berkongsi tentang kejayaan dan hasil penyelidikan mereka.

Kerjasama yang diberi oleh Unit Pengurusan Korporat kepada pihak media dan kesediaannya membantu mendapatkan bahan yang boleh disiarkan telah membantu FRIM mendapatkan ruang dalam rancangan Bumi Kita RTM, yang disiarkan pada awal 2010 bermula bulan April. Selain itu, FRIM juga menerima liputan dari MHI (TV3), Nasi Lemak Kopi O (TV9), BFM Radio, Agrotek (RTM), Bernama, Thomson Reuters, Astro Planet TVIQ dan majalah dalam talian. Walau bagaimanapun, nilai PR bagi program-program ini tidak diperolehi.

4. World Forestry Day—21 March
5. Green Cycle—6 June.

There were 44 feature articles published in the newspapers related to FRIM's researchers and research activities; with over 20 FRIM researchers highlighted in the various reports.

As a result of the cooperation given by the Corporate Management Unit (CCU) to the media and FRIM's willingness to assist in providing the required information, FRIM was extensively featured in the RTM *Bumi Kita* programme, aired starting April 2010. Apart from that, FRIM also received coverage from MHI (TV3), *Nasi Lemak Kopi O* (TV9), BFM Radio, Agrotek (RTM), Bernama, Thomson Reuters, Astro Planet TVIQ, and on-line magazines, of which the PR values were not known.

# ANALISIS KEBERKESANAN KOS

## COST-BENEFIT ANALYSIS

### Penilaian Awalan Produktiviti Makmal-Makmal di FRIM dalam Menjana Pendapatan

Kajian ringkas bagi penilaian makmal-makmal di FRIM telah dibuat pada 1–15 November. Objektif kajian ini adalah untuk menilai produktiviti makmal-makmal di FRIM dalam menjana pendapatan. Data primer berkaitan jumlah pendapatan dan jumlah input kakitangan untuk makmal tersebut telah dikumpulkan. Terdapat 19 buah makmal yang memberikan maklum balas iaitu:

#### Tumbuhan Ubatan

1. Etnobiologi (EB)
2. Makmal Anti Mikrob (MAM)
3. Makmal Kimia (MK)
4. Makmal Instrumentasi (MI)
5. Makmal Teknologi Minyak Pati (MTP)
6. Makmal Formulasi Produk (MFP)

#### Perhutanan & Alam Sekitar

1. Remote Sensing & GIS (RSGI)

#### Biodiversiti Hutan

1. Pengurusan Herbarium & Botani (KEP & BOT)
2. Zoologi (ZOO)
3. Entomologi (ENTO)
4. Mikologi & Patologi (MIKO)
5. Pemuliharaan & Biodiversiti Informatif (PULIH)

#### Keluaran Hutan

1. Pulpa & Kertas (PK)
2. Makmal Pengerangan Kayu (WDL)
3. Pembangunan Bahan Baru (PBB)

#### Bioteknologi Hutan

1. Kultur Tisu (TC)
2. Genetik (GEN)
3. Teknologi Biji Benih (TBB)
4. Kimia Tanah (SC)

Walau bagaimanapun, hanya 15 buah makmal sahaja yang terlibat untuk dianalisis kerana empat makmal yang lain tidak mempunyai maklumat berkaitan pendapatan. Maklumat berkaitan pendapatan ini termasuk ujian, perundingan, latihan, seminar dan perkhidmatan lain. Analisis data hanya memfokuskan kepada produktiviti separa seperti yang ditunjukkan di dalam Rajah 1. Analisis ini menggunakan andaian peratusan peruntukan masa untuk perkhidmatan yang seragam iaitu 5%, 15% dan 30%. Tahap produktiviti makmal akan berkurangan dengan peningkatan masa yang diperuntukkan untuk perkhidmatan. Berdasarkan peruntukan masa bagi perkhidmatan sebanyak 5%, terdapat sembilan buah makmal yang produktif dalam menjana pendapatan iaitu; Remote Sensing dan GIS (RSGI), Entomologi (ENTO), Kimia tanah (SC), Genetik (GEN), Instrumentasi (MI), Pulpa dan Kertas (PK), Anti Mikrob (MAM), Kultur Tisu (TC) dan Pembangunan Bahan Baru (PBB) (rujuk Rajah 1).

### Preliminary Assessment of Productivity of FRIM's Laboratories in Generating Income

A quick study to assess FRIM's laboratories was conducted on 1–15 November. The objective of this study was to evaluate the productivity of FRIM's laboratories in generating income. Primary data on total income and total labour input in particular laboratories were collected. There were 19 laboratories which provided feedbacks as follows:

#### Medicinal Plants Division:

1. Ethno Biology (EB)
2. Anti Microbes (MAM)
3. Chemical (MK)
4. Instrumentation (MI)
5. Essential Oil Technology (MTP)
6. Product Formulation (MFP)

#### Forestry & Environment Division:

1. Remote Sensing & GIS (RSGI)

#### Forest Biodiversity Division:

1. Herbarium Management & Botany (KEP & BOT)
2. Zoology (ZOO)
3. Entomology (ENTO)
4. Mycology & Pathology (MIKO)
5. Conservation & Biodiversity Informatics (PULIH)

#### Forest Products Division:

1. Pulp & Paper (PK)
2. Wood Drying Laboratory (WDL)
3. Development of New Material (PBB)

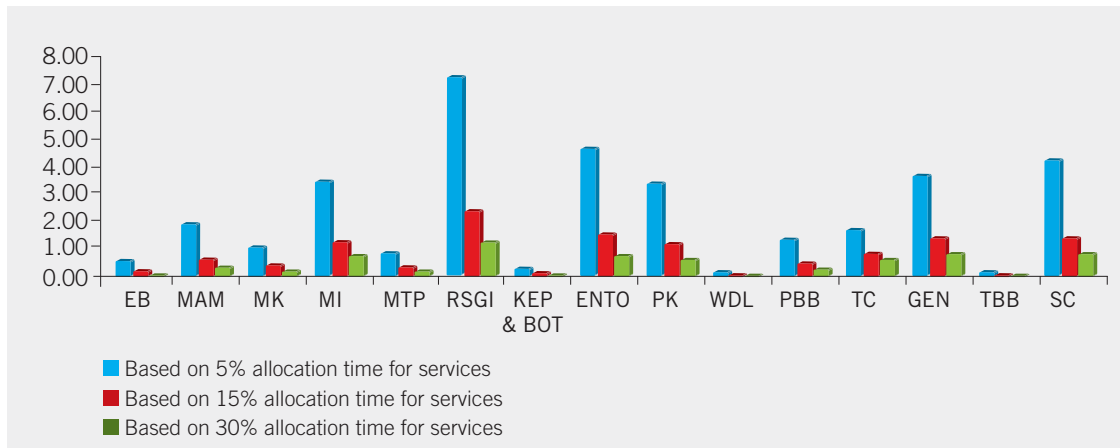
#### Forest Biotechnology Division:

1. Tissue Culture (TC)
2. Genetics (GEN)
3. Seed Technology (TBB)
4. Soil Chemistry (SC)

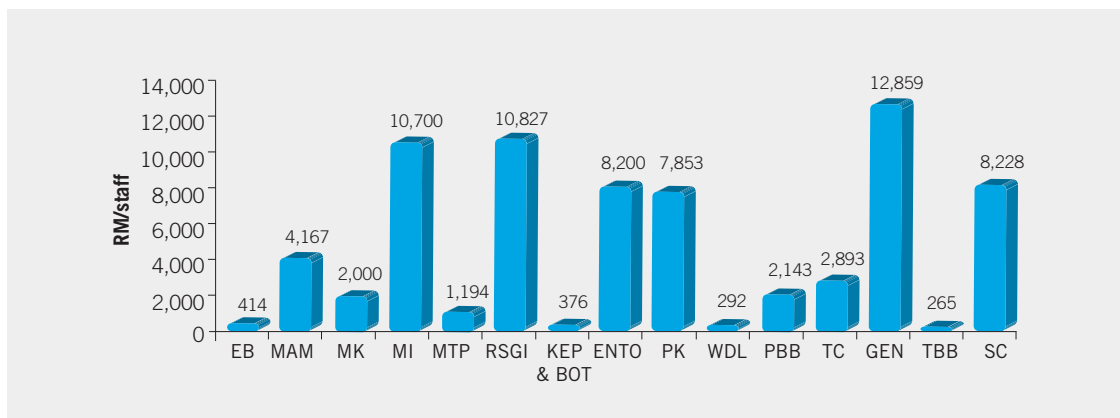
However, only 15 laboratories were involved in data analysis because the other four laboratories did not have information on income. Information on income included testing, consultation, training, seminar and other services. The analysis only focused on partial productivity as shown in Figure 1. The analysis used assumption based on standard percentages of allocation time for services which were 5%, 15% and 30%. The productivity of laboratories will decrease when the percentage of allocation time for services increases. Based on 5% allocation time for services, nine laboratories were productive in generating income, i.e. Remote Sensing and GIS (RSGI), Entomology (ENTO), Soil Chemistry (SC), Genetics (GEN), Instrumentation (MI), Pulp and Paper (PK), Anti Microbes (MAM), Tissue Culture (TC) and Development of New Material (PBB) (Figure 1).

Dari aspek penjanaan pendapatan bagi setiap kakitangan pula, enam makmal yang paling tinggi ialah; Genetik (GEN), Remote Sensing dan GIS (RSGI), Instrumentasi (MI), Kimia tanah (SC), Entomologi (ENTO) dan Pulpa dan Kertas (PK). Makmal Genetik mampu menjana pendapatan sebanyak RM12 859 bagi setiap kakitangan, diikuti oleh Unit Remote Sensing dan GIS (RSGI) dan Makmal Instrumentasi (MI), masing-masing sebanyak RM10 827 dan RM10 700 bagi setiap kakitangan pada tahun 2010 (Rajah 2).

In terms of income generated per staff member for individual laboratories, top six laboratories were among the highest, i.e. Genetics (GEN), Remote Sensing and GIS (RSGI), Instrumentation (MI), Soil Chemistry (SC), Entomology (ENTO), and Pulp and Paper (PK). The Genetics laboratory was able to generate income as much as RM12 859 per staff member, followed by Remote Sensing and GIS unit and Instrumentation's laboratory at RM10 827 and RM10 700 per staff member respectively (Figure 2).



**Rajah 1** Tahap produktiviti bagi beberapa makmal FRIM, 2010  
**Figure 1** Productivity levels of selected FRIM's laboratories, 2010



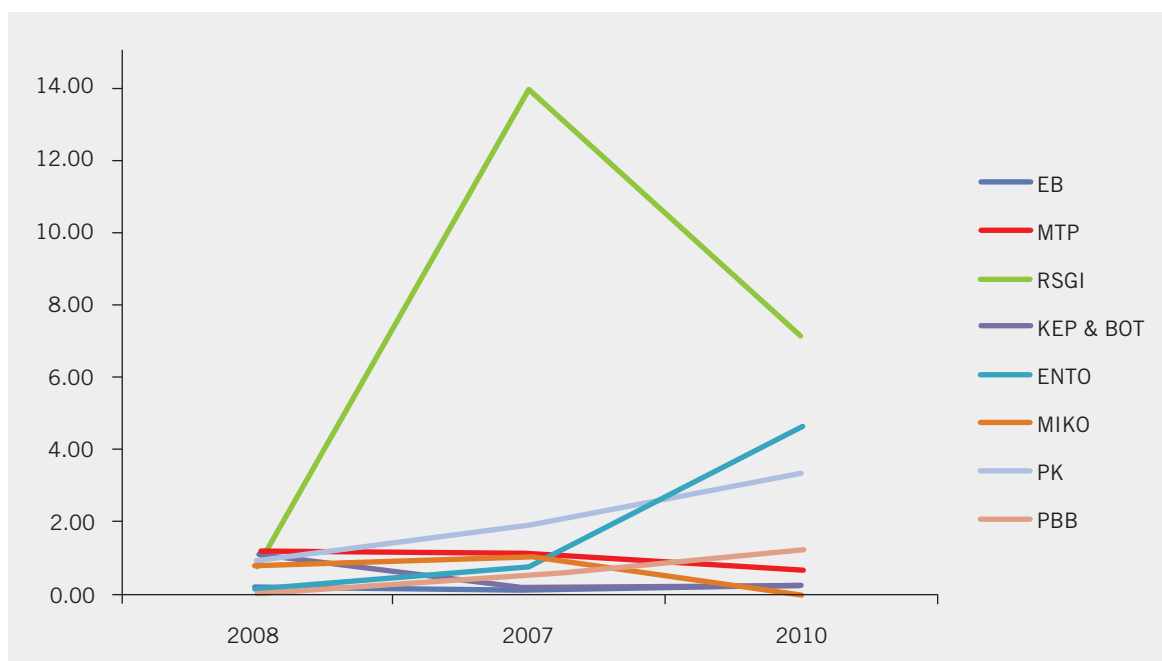
**Rajah 2** Penjanaan pendapatan bagi setiap kakitangan di beberapa makmal FRIM, 2010  
**Figure 2** Incomes generated per staff member in selected FRIM's laboratories, 2010

Analisis trend dari tahun 2008 hingga 2010 pula menunjukkan hanya tiga buah makmal yang menunjukkan peningkatan produktiviti setiap tahun iaitu Entomologi (ENTO), Pulpa dan Kertas (PK) dan Pembangunan Bahan Baru (PBB) (Rajah 3). Manakala trend produktiviti makmal-makmal yang lain pula tidak menentu. Kesimpulannya, penilaian ini membolehkan kita membandingkan tahap produktiviti di dalam bahagian dan antara bahagian di FRIM. Maklumat ini boleh membantu pihak pengurusan memantau pencapaian mereka dan merencana strategi untuk penambahbaikan yang berterusan bagi memberikan penyampaian perkhidmatan kelas pertama.

RSGI menunjukkan trend produktiviti yang tidak konsisten dari tahun 2008-2010. Pada tahun 2009 produktiviti RSGI meningkat sebanyak 1666% daripada nilai produktiviti hanya 0.8 pada 2008 kepada 13.9 pada 2009. Manakala pada tahun 2010 nilai produktiviti menurun sebanyak 48% kepada 7.2. Senario ini berlaku kerana pada tahun 2009 RSGI menerima sebuah projek konsultansi yang bernilai RM250 000.

The trend analysis from 2008 to 2010 shows that only three laboratories increased their productivity over the years constantly, i.e. Entomology (ENTO), Pulp & Paper (PK), and Development of New Material (PBB), while other laboratories fluctuated in their trends (Figure 3). In conclusion, this assessment enables a comparison to be made of the productivity with and between divisions in FRIM. This information will help the management in monitoring its performance, planning and strategies for further continuous improvement in delivering first-class services.

RSGI shows inconsistent productivity trends from year 2008-2010. RSGI productivity level increased by 1.666% in 2009 from productivity value of 0.8 in 2008 to 13.9 in 2009. Whereas in 2010 their productivity decreased by 48% to 7.2. This scenario occurs because in 2009 RSGI involved in a consultancy project worth RM250 000.



**Rajah 3** Trend tahap produktiviti bagi beberapa makmal FRIM, 2008-2010  
**Figure 3** Trends in productivity levels of selected FRIM's laboratories, 2008-2010

## ANUGERAH DAN PENGIKTIRAFAN AWARDS AND RECOGNITION

### Anugerah Buku Negara

Penerbitan FRIM yang bertajuk “FRIM Tapak Warisan Semula Jadi Negara” telah memenangi Anugerah Buku Negara bagi kategori Buku Teknikal Terbaik. Anugerah disampaikan kepada Ketua Pengarah FRIM, Dato’ Dr Abd Latif Mohmod oleh Timbalan Menteri Pengajian Tinggi, Dato’ Saifudin Abdullah di Majlis Anugerah Buku Negara di Kuala Lumpur pada 16 Disember. Majlis tersebut dirasmikan oleh isteri YAB Perdana Menteri, Datin Seri Rosmah Mansor yang juga merupakan penaung Yayasan Pembangunan Buku Negara. Anugerah ini merupakan satu pengiktirafan terhadap usaha-usaha FRIM menghasilkan penerbitan saintifik dalam bentuk yang lebih mudah disalur dan dihayati oleh masyarakat di Malaysia sejak 2008 terutamanya melalui penerbitan drastik buku-buku mewah.

Buku yang disunting oleh Dr Shamsudin Ibrahim, Dr Ismail Parlan, Dr Khali Aziz Hamzah, Nik Zanariah Nik Mahmood, Dr Ahmad Zuhaidi Yahya, Hamdan Omar dan Adnan Mohammad dilancarkan oleh mantan Perdana Menteri, Tun Abdullah Haji Ahmad Badawi sempena Majlis Perisytiharan FRIM sebagai Tapak Warisan Semula Jadi Negara pada 18 November. Buku yang mengandungi 194 muka surat dan sembilan bab itu antara lain menyediakan maklumat tentang sejarah FRIM, usaha-usahanya ke arah melindungi hutannya daripada kerakusan pembangunan, keunikan semula jadinya serta kekayaan biodiversitinya.

### The National Book Award

FRIM publication entitled *FRIM Tapak Warisan Semula Jadi Negara* won the National Book Award 2010 for the Best Technical Book category. The award was presented to the FRIM Director General (DG) Dato’ Dr Abd Latif Mohmod by Deputy Minister for Higher Education Dato’ Saifudin Abdullah at the National Book Award Ceremony 2010 in Kuala Lumpur on 16 December. The ceremony was officiated by the Prime Minister’s wife Datin Paduka Seri Rosmah Mansor who is also the Patron of the National Book Development Foundation. The award was given to the Institute in recognition of its intensified efforts since 2008 to produce scientific publications that are easy to read for public consumption.

The book, edited by Dr Shamsudin Ibrahim, Dr Ismail Parlan, Dr Khali Aziz Hamzah, Nik Zanariah Nik Mahmood, Dr Ahmad Zuhaidi Yahya, Hamdan Omar and Adnan Mohammad, was launched by Former Prime Minister Tun Abdullah Haji Ahmad Badawi at the Institute’s Heritage Site Declaration Ceremony on 18 November. The book, containing 194 pages and nine chapters, provides an insight into the history of FRIM, its struggle to protect its forest against the encroachment of development, its natural uniqueness as well as its biodiversity richness, among others.



Sijil dan trofi Anugerah Buku Negara  
Certificate and trophy of the National Book Award



Tun Abdullah (kanan) menerima buku "FRIM Tapak Warisan Semula Jadi Negara" daripada KP FRIM (kiri), dengan diperhatikan oleh Tun Jeanne, Hajah Nancy dan Hajah Nooraine  
 Tun Abdullah (right) receiving a copy of the book *FRIM Tapak Warisan Semula Jadi* from the FRIM DG (left), while Tun Jeanne, Hajah Nancy and Hajah Nooraine look on



Mantan PM dan isterinya sedang melihat *crown shyness* di Denai Salleh selepas majlis perasmian pengisytiharan tersebut  
 The former PM and wife taking a look at the crown shyness along the Salleh Trail after the official ceremony



Tun Abdullah selepas menandatangani plak Warisan  
 Tun Abdullah after penning his signature on the Warisan plaque



Tun Abdullah dan isteri menerima sijil "Friends of FRIM" daripada Hajah Nancy selepas menanam pokok chengal  
 Tun Abdullah and wife presented with a "Friends of FRIM" certificate by Hajah Nancy after planting a chengal tree

### Perisytiharan FRIM sebagai Tapak Warisan Semula Jadi

FRIM meraikan pengisytiharan rasmi kampusnya di Kepong sebagai salah sebuah Tapak Warisan Semula Jadi Negara pada 19 November. Perisytiharan ini diharapkan dapat membuka laluan ke arah mencapai pengiktirafan tapak warisan dunia pula. Majlis perisytiharan disempurnakan oleh mantan Perdana Menteri Tun Abdullah Ahmad Badawi dengan pemasangan plak Warisan. Tun Abdullah yang diiringi oleh isteri beliau, Tun Jeanne Abdullah turut melancarkan penerbitan FRIM yang bertajuk *FRIM Tapak Warisan Semula Jadi Negara*. Tun Abdullah turut menyampaikan sijil-sijil Friends of FRIM kepada badan-badan korporat sama ada yang telah bekerjasama rapat dengan FRIM mahupun yang memberi sokongan dalam kempen-kempen kesedaran awam, pendidikan alam sekitar, pemeliharaan hutan dan penanaman pokok. Mantan Perdana Menteri dan isteri turut mengambil bahagi dalam upacara penanaman pokok sebagai kenangan lawatan mereka ke FRIM. Turut hadir ialah Pengerusi MFRDB, Hajah Nancy Hj Shukri, dan Pengarah bahagian Perkhidmatan Pengurusan Jabatan Warisan Negara, Hajah Nooraine Hj Mohd Noordin.

### Official Declaration of FRIM as a Natural Heritage Site

FRIM celebrated the official declaration of its campus in Kepong on 19 November as one of the country's natural heritage sites, whilst setting its sight on attaining world heritage recognition in the future. The ceremony was officiated by former Prime Minister Tun Abdullah Haji Ahmad Badawi, who also unveiled the Warisan plaque. At the ceremony, Tun Abdullah, accompanied by wife, Tun Jeanne Abdullah, also launched FRIM's publication entitled *FRIM Tapak Warisan Semula Jadi Negara*. Tun Abdullah also presented "Friends of FRIM" certificates to corporate bodies which had worked closely with FRIM or supported its public awareness, environmental education, forest conservation and tree planting efforts. The former Prime Minister and his wife also took part in a tree planting ceremony to mark their first visit to FRIM. Also present were the MFRDB Chairperson Hajah Nancy Shukri, and National Heritage Department Management Service Division Director Hajah Nooraine Hj Mohd Noordin.

## Anugerah Penyumbang Kecemerlangan Kanak-Kanak APECP 2009/2010

FRIM telah menerima Anugerah Penyumbang Kecemerlangan Kanak-Kanak APECP 2009/2010 bagi Destinasi Ekopendidikan Mesra Kanak-Kanak daripada *Association of Professional Early Childhood Providers Malaysia* (APECP) pada 31 Mac. Anugerah ini mengiktiraf perniagaan, organisasi tidak berasaskan keuntungan, badan-badan kerajaan (tempatan, negeri dan persekutuan), institusi pendidikan dan juga individu yang telah memberi sumbangan penting ke arah meningkatkan kualiti dan menyediakan perkhidmatan yang cemerlang dalam pendidikan, penjagaan dan perkembangan awal kanak-kanak di Malaysia. Anugerah diterima oleh Dato' Dr Abd. Latif Mohmod, Ketua Pengarah FRIM daripada Dr K H Wang, Pengarah Eksekutif Kumpulan Smart Reader® Worldwide merangkap Presiden APECP.

## APECP Excellent Child Contributor Award 2009/2010

FRIM received the APECP Excellent Child Contributor Award 2009/2010 for Child-Friendly Eco-Education Destination from the Association of Professional Early Childhood Providers Malaysia (APECP) on 31 March 2010. The APECP Excellent Child Contributor Award 2009/2010 is given to honour businesses, non-profit organizations, governments (local, state and federal), educational institutions and individuals who have made significant contributions towards improving quality and providing excellent services in early childhood education, care and development in Malaysia. FRIM Director General (DG) Dato' Dr Abd Latif Mohmod received the award from Dr K H Wang, Group Executive Director of Smart Reader® Worldwide and President of APECP.



KP FRIM (kiri) bersama-sama DYTU Tuanku Hajjah Lailatul Shahreen Akashah Khalil, Raja Puan Muda Perlis yang juga penaung APECP (kanan) serta Dr KH Wang (tengah), Presiden APECP  
FRIM's DG (left) with DYTU Tuanku Hajjah Lailatul Shahreen Akashah Khalil, Raja Puan Muda Perlis, also Patron of APECP (right) and President Dr KH Wang of APECP (middle)

## Pelantikan sebagai Naib Presiden IUFRO

Pada bulan Ogos, Dr Lee Su See, seorang pegawai penyelidik kanan FRIM telah dilantik sebagai Naib Presiden IUFRO. Beliau merupakan satu-satunya wanita yang pernah diberikan penghormatan sebagai Naib Presiden bagi IUFRO, sebuah badan dunia yang kini mencapai umur 118 tahun.

## Appointment of IUFRO Vice-President

In August, Dr Lee Su See, FRIM's senior research officer, was appointed Vice-President of IUFRO. She is the only lady ever given the recognition as Vice-President of IUFRO, the world organization of 118 years.

### Anugerah Kecemerlangan Makmal IKM

Tiga buah makmal di FRIM telah merangkul anugerah sempena Malam Kimia 2010 anjuran Institut Kimia Malaysia (IKM) di Kuala Lumpur pada 10 Disember. Majlis ini yang diadakan di Pusat Konvensyen Sime Darby di Kuala Lumpur dirasmikan oleh Menteri Sains, Teknologi dan Inovasi, YB Datuk Seri Dr Maximus Johnity Ongkili. Makmal Analisis Awetan Kayu memenangi Anugerah Emas Kecemerlangan Makmal IKM di atas kejayaannya mengekalkan Anugerah Kecemerlangan Makmal IKM selama 15 tahun berturut-turut. Selain itu, Makmal Kimia Tanah, Makmal Ujian Komposit Kayu dan Makmal Analisis Awetan Kayu turut menerima anugerah Anugerah Kecemerlangan Makmal IKM 2010.

### IKM Laboratory Excellence Awards

Three laboratories of the Forestry Research Institute Malaysia (FRIM) received IKM Laboratory Excellence Awards at the Malaysian Institute of Chemistry's (IKM) 2010 annual dinner and award presentation ceremony on 10 December. The event, held at the Sime Darby Convention Centre in Kuala Lumpur, was officiated by the Science, Technology and Innovation Minister Datuk Seri Dr Maximus Johnity Ongkili. The Wood Preservative Analytical Laboratory was given the Gold Plaque Award for receiving the Excellent Laboratory Awards for the 15th consecutive years. The three laboratories awarded were the Soil Chemistry Laboratory, the Wood Composite Testing Laboratory and the Wood Preservative Analytical Laboratory.



Ketua Unit Pengurusan Kualiti FRIM, Puan Salamah Selamat menerima anugerah daripada Timbalan Ketua Pengarah (Operasi) Jabatan Kimia Malaysia, Datin Maharam Jusoh  
Head of FRIM Quality Management Unit, Puan Salamah Selamat received the award from the Department of Chemistry Malaysia's Deputy Director General (Operations), Datin Maharam Jusoh

### Anugerah Pencapaian Sainifik IUFRO

Dr Nor Azah Mohammad Ali, seorang pegawai penyelidik FRIM, telah menerima Anugerah Pencapaian Sainifik Pertubuhan Organisasi Penyelidikan Perhutanan Antarabangsa (IUFRO) sempena Kongres Sedunia IUFRO di Seoul, Republik Korea pada 23 Ogos. Dr Nor Azah adalah antara 11 orang saintis di seluruh dunia yang memenangi anugerah tersebut. Beliau mempunyai pengalaman selama 23 tahun dalam bidang penyelidikan serta mengetuai pasukan penyelidikan ke atas kimia produk semula jadi khususnya pati minyak yang berkaitan dengan industri pertanian dan herba. Dr Nor Azah telah memfailkan tiga pendedahan reka cipta hasil penemuan penyelidikan beliau dan telah dikomersialkan oleh pihak industri herba. Beliau juga terlibat secara langsung dalam penyelidikan ke atas kayu gaharu.

### IUFRO Scientific Achievement Award

FRIM researcher Dr Nor Azah Mohammad Ali received the International Union of Forest Research Organisations (IUFRO) Scientific Achievement Award at the (IUFRO) World Congress held in Seoul, Republic of Korea, on 23 August. Dr Nor Azah was among 11 scientists worldwide to receive the award. Dr Nor Azah has 23 years of research experience and leads a team in natural product chemistry specializing in essential oil research related to forestry agriculture and herbal industries. She has filed three invention disclosures for her research and her work has been taken up and commercialized by the herbal Industries. She is also directly involved in agar wood research.



## Anugerah Kecemerlangan Pelajar dalam Sains Perhutanan IUFRO

Pegawai penyelidik FRIM, Tnah Lee Hong telah menerima Anugerah Kecemerlangan Pelajar dalam Sains Perhutanan IUFRO. Beliau merupakan salah seorang daripada tiga pemenang bagi kategori ini. Bidang penyelidikan Tnah meliputi teknologi penanda molekular, forensik perhutanan, filogeografi dan genetik populasi tumbuhan. Melalui tesis sarjana yang bertajuk “DNA Fingerprint Databases of Chengal (*Neobalanocarpus heimii*) for Forensic Forestry Investigations,” beliau telah membangunkan pangkalan data komprehensif yang pertama bagi spesies tropika. Pangkalan data cap jari DNA bagi spesies-spesies yang penting di Malaysia dapat membantu dalam penguatkuasaan pencegahan pembalakan haram.

## IUFRO Student Award for Excellence in Forest Sciences

FRIM research officer Tnah Lee Hong, who is attached to the FRIM Genetics Laboratory, received the IUFRO Student Award for Excellence in Forest Sciences. She was one of the three winners for this category. Tnah’s research areas cover molecular markers technology, forensic forestry, phylogeography and plant population genetics. With her Masters thesis on “DNA Fingerprint Databases of Chengal (*Neobalanocarpus heimii*) for Forensic Forestry Investigations,” she has developed comprehensive databases which are the first for tropical species. The availability of DNA fingerprinting databases for the important timber species in Malaysia will help to enhance the forestry enforcement officials capacity to curb illegal logging.



Tnah Lee Hong menerima anugerah daripada Pengerusi JK Pengiktirafan dan Anugerah IUFRO, Dr Lee Su See  
Tnah Lee Hong receiving her award from the Chairperson of the IUFRO Honours and Awards Committee, Dr Lee Su See

## Anugerah INNOVA 2010

Kumpulan penyelidik FRIM dengan projek bertajuk “Gaharu Sense” memenangi pingat emas dalam pertandingan inovasi di Brussels (INNOVA 2010) yang diadakan pada 18–20 November. Ini merupakan antara hasil R&D FRIM di bawah geran ScienceFund MOA yang telah tamat pada tahun ini.

## Pelantikan sebagai Ahli Bersekutu ASM

Timbalan Ketua Pengarah (Penyelidikan dan Pembangunan), Dato’ Dr Abdul Rashid Abd. Malik dan Timbalan Ketua Pengarah (Operasi), Dr Abdul Rahim Nik telah dilantik sebagai Ahli Bersekutu Akademi Sains Malaysia (ASM) bagi tempoh Julai 2010–Jun 2012 oleh ASM.

## INNOVA Award 2010

FRIM’s research team with their project entitled “Gaharu Sense” won a gold medal award in an innovation competition held in Brussels (INNOVA 2010) from 18 to 20 November. This was among the findings from FRIM’s R&D project under ScienceFund MOA grant which was completed this year.

## Appointment as ASM Associates

Deputy Director General (Research and Development) Dato’ Dr Abdul Rashid Abd. Malik and Deputy Director General (Operational) Dr Abdul Rahim Nik were appointed Associates of the Academy of Sciences Malaysia (ASM) for a two-year term (July 2010–June 2012) by the ASM.

## Anugerah Emas dan Anugerah Terbaik Keseluruhan IRIIE 2010

Pegawai Penyelidik FRIM, Nor Datiakma Mat Amin telah memenangi Pingat Emas dan trofi Anugerah Terbaik Keseluruhan bagi penyelidikan yang bertajuk “Anti-Multidrug Resistant *Staphylococcus aureus* (MRSA) Activity of Euphorbiaceae Leaves Extract” sempena IIUM *Research, Invention and Innovation Exhibition* (IRIIE 2010) di Universiti Islam Antarabangsa Malaysia pada 26 dan 27 Januari. Nor Datiakma, lulusan ijazah sarjana dari Universiti Islam Antarabangsa Malaysia yang menjalankan kajian tersebut untuk tesis sarjana menerima anugerah di bawah kategori Sains, Kejuruteraan dan Teknologi. Kajian beliau menyingkap potensi ejen anti-MRSA yang diperoleh daripada ekstrak pati daun Euphorbiaceae yang mendapati aktiviti anti-MRSA adalah setanding dengan antibiotik Oxacillin yang digunakan secara klinikal untuk rawatan jangkitan MRSA.

## Anugerah Inovasi Cemerlang Negeri Selangor 2010

Kumpulan penyelidik FRIM telah memenangi tempat pertama Anugerah Inovasi Cemerlang Negeri Selangor 2010 bagi kategori inovasi untuk kegunaan industri sempena Festival Sains, Teknologi dan Inovasi Negeri Selangor 2010. Kumpulan penyelidik yang diketuai oleh Hashim Wan Samsi yang membangunkan lantai terjurutera dari tandan kelapa sawit telah menerima piala, wang tunai berjumlah RM8000 dan sijil daripada Menteri Besar Selangor, Tan Sri Abdul Khalid Ibrahim, pada 12 Jun. Festival pada tahun ini diadakan dari 1–13 Jun di Kompleks PKNS di Shah Alam bertemakan “Rakyat kreatif Selangor inovatif.”

## Anugerah Saintifik Lain

Seperti pada tahun-tahun yang lepas, para penyelidik FRIM terus memenangi pelbagai anugerah saintifik di peringkat antarabangsa dan kebangsaan, seperti *Malaysian Technology Expo, 21<sup>st</sup> International Invention and Innovation Exhibition* dan Anugerah Reka Cipta FRIM.

Penyelidik-penyelidik FRIM memenangi tiga pingat perak dan tiga pingat gangsa di Ekspo Teknologi Malaysia (MTE 2010) yang diadakan di Pusat Dagangan Dunia Putra, Kuala Lumpur dari 4–6 Februari.

*Resin Impregnated Oil Palm Flooring, Engineered Flooring from Oil Palm Trunk* dan *Super Palmply (super palm plywood from oil palm trunk)* berjaya memperoleh pingat perak, manakala *Environmentally Friendly Carbonisation Using the Drum Method, Synthetic Seeds of Timber Species: An Alternative for Sustainable Planting Material for Commercial Plantations*, dan *Fabrication of a Recognition Process for Agarwood Classification Using Modified E-nose* menerima gangsa.

Bagi pertandingan inovasi sempena Pameran ITEX 2010 pada 14–16 Mei di Pusat Konvensyen Kuala Lumpur KL Convention Centre, beberapa inovasi penyelidik FRIM menerima lima pingat emas, satu perak, satu gangsa dan tiga anugerah produk inovatif Malaysia.

## The Gold and Overall Best IRIIE 2010 Awards

FRIM's research officer Nor Datiakma Mat Amin won a Gold Medal and the Best Overall Award trophy for her research on “Anti-Multidrug Resistant *Staphylococcus aureus* (MRSA) Activity of Euphorbiaceae Leaf Extract” at the recent IIUM *Research, Invention and Innovation Exhibition* (IRIIE 2010) held at the International Islamic University of Malaysia (IIUM) from 26 to 27 January. Nor Datiakma, a postgraduate student of the International Islamic University of Malaysia (IIUM), who conducted the research for her Master's degree, received these awards under the category of Science, Engineering and Technology. The research unveils the potential of anti-MRSA agent derived from crude extract of Euphorbiaceae leaf, where the anti-MRSA activity is found to be comparable with oxacillin-antibiotics used clinically for treatment of MRSA infection.

## Selangor Excellent Innovation Award 2010

FRIM researchers' team won first place at the Selangor Science Technology and Innovation Festival 2010 (FesSTIS) for the Selangor Excellent Innovation Award 2010 under the category of innovation for industrial use. The research team led by Hashim Wan Samsi that developed the Engineered Flooring from Oil Palm Trunk received the trophy, cash prize of RM8000 cash and certificates from the Selangor Menteri Besar Tan Sri Abdul Khalid Ibrahim on 12 June. This year's festival, held from 11 to 13 June at the PKNS Complex in Shah Alam, was themed “Creative people, innovative Selangor”.

## Other Scientific Awards

Like in previous years, FRIM researchers bagged various scientific awards at national and international levels, such as the *Malaysian Technology Expo, 21<sup>st</sup> International Invention and Innovation Exhibition* and *FRIM Invention Award*.

FRIM researchers clinched three silver and three bronze medals at the *Malaysia Technology Expo (MTE 2010)* held at the *Putra World Trade Centre, Kuala Lumpur*, from 4 to 6 February.

The works, *Resin Impregnated Oil Palm Flooring, Engineered Flooring from Oil Palm Trunk* and *Super Palmply (Super Palm Plywood from Oil Palm Trunk)* garnered silver medals, while *Environmentally Friendly Carbonization Using the Drum Method, Synthetic Seeds of Timber Species: An Alternative for Sustainable Planting Material for Commercial Plantations*, and *Fabrication of a Recognition Process for Agarwood Classification Using Modified E-nose* received bronze medals.

For the innovation competition held in conjunction with the *ITEX Exhibition 2010* on 14–16 May at *Kuala Lumpur Convention Centre*, FRIM's innovations bagged five gold awards, one silver, one bronze and three *Malaysian innovative products award*.



En Puad Elham (kiri) di ITEX 2010  
Mr Puad Elham (left) at the ITEX 2010

### Anugerah Pingat/Darjah Kebesaran

Pada tahun ini, seramai enam orang penjawat awam FRIM telah menerima pingat daripada DYMM Seri Paduka Baginda Yang di-Pertuan Agong iaitu Dr Aminah Hamzah, pingat Kesatria Mangku Negara (KMN); Dr Mohd Noor Mahat, Ahli Mangku Negara (AMN); Puan Norziah Salleh, Puan Zarah Bachik dan En Mohd Mohd Sahat menerima Pingat Pangkuan Negara (PPN). Tiga orang penjawat awam FRIM menerima pingat daripada Ke Bawah DYMM Sultan Pahang, iaitu Dr Raja Barizan Raja Sulaiman, pingat Setia Mahkota Pahang (SMP); manakala En. Abdul Rahim Ahmad, En. Salen Ismail dan En. Abdul Molok Abdul Ghani menerima anugerah Pingat Jaksa Kebaktian (PJK). En Othman Hasin dianugerahi Pingat Perkhidmatan Lama (PPL) oleh DYMM Raja Perlis dan En Muhammad Deraman menerima Pingat Pekerti Terpilih (PPT) dari DYMM Sultan Selangor.

### Honorary Awards

During the year, six FRIM staff members were conferred medals by DYMM Seri Paduka Baginda Yang di-Pertuan Agong, i.e. Dr Aminah Hamzah, Kesatria Mangku Negara (KMN); Dr Mohd Noor Mahat, Ahli Mangku Negara (AMN); Puan Norziah Salleh, Puan Zarah Bachik and Mr Mohd Mohd Sahat, Pingat Pangkuan Negara (PPN). Four other staff members received their medals from Ke Bawah DYMM Sultan Pahang, i.e., Dr Raja Barizan Raja Sulaiman, pingat Setia Mahkota Pahang (SMP); whereas Mr Abdul Rahim Ahmad, Mr Salen Ismail dan Mr Abdul Molok Abdul Ghani, Pingat Jaksa Kebaktian (PJK). Mr Othman Hasin was conferred Pingat Perkhidmatan Lama (PPL) from DYMM Raja Perlis and Mr Muhammad Deraman, Pingat Pekerti Terpilih (PPT) from DYMM Sultan Selangor.



Berdiri/Standing (kiri ke kanan/left to right): Abdul Molok, Dr Ahmad Zuhaidi, Salen, Rahim dan Dr Mohd Noor  
Duduk/Seated (kiri ke kanan/left to right): Zarah, Dr Aminah, Roszali, Dato' Dr Abd Latif, Muhammad, Norziah and Dr Raja Barizan  
Tiada dalam gambar/Not in picture: Mohd Mohd Sahat, Othman

## TANGGUNGJAWAB SOSIAL KORPORAT CORPORATE SOCIAL RESPONSIBILITY

Terdapat 23 aktiviti tanggungjawab sosial korporat yang dijalankan oleh FRIM pada tahun 2010. Antara aktiviti utama ialah:

### Gotong-royong di Tanjung Lipat

Lebih 100 orang termasuk 40 kakitangan FRIM telah menyertai program gotong-royong untuk membersihkan Pantai Tanjung Lipat, Likas, Sabah pada 24 Januari. Program kerja amal yang dianjurkan bersama Universiti Malaysia Sabah (UMS) dan Dewan Bandaraya Kota Kinabalu (DBKK) itu merupakan hasil inisiatif FRIM sempena lawatan rombongan kakitangannya selama empat hari ke Sabah bermula 23 Januari. Objektif program tersebut adalah untuk memupuk kesedaran orang ramai tentang kepentingan sumbangan masyarakat terhadap penjagaan dan pemuliharaan ekosistem pantai.

Sempena ulang tahunnya yang ke-25 tahun ini, FRIM berharap dapat meningkatkan sumbangannya melalui aktiviti-aktiviti penyelidikan serta kemasyarakatan untuk kesejahteraan negara. Aktiviti gotong-royong tersebut juga memberi peluang bagi mempereratkan hubungan antara FRIM dengan agensi-agensi lain di Sabah serta menyemai semangat 1Malaysia.

There were 23 major corporate social activities carried out by FRIM in 2010. Among the highlights were:

### Gotong-royong at Tanjung Lipat

Over 100 volunteers including 40 staff members FRIM participated in a *gotong-royong* programme to clean up the Tanjung Lipat beach in Likas, Sabah, on 24 January. The programme, jointly organised with Universiti Malaysia Sabah (UMS) and the Kota Kinabalu City Hall (DBKK), was initiated by FRIM as its community service contribution in conjunction with a four-day visit by its staff members to the beautiful "Land below the wind" starting 23 January. The objective of the campaign is to increase public awareness on the importance of community involvement in the protection and conservation of the marine ecosystems.

In celebrating its 25<sup>th</sup> Anniversary in 2010, FRIM hoped to enhance its contribution through research and its involvement in community service activities for the well being of the country. The *gotong-royong* programme also provided opportunities for the strengthening of relationship between FRIM and its counterparts in Sabah in the spirit of 1Malaysia.



Antara sukarelawan yang menyertai program gotong-royong di Tanjung Lipat  
Among the volunteers that participated in a gotong-royong programme at Tanjung Lipat

## Warga FRIM memberi keceriaan kepada warga emas

Satu rombongan kakitangan FRIM yang diketuai oleh Ketua Pengarah Dato' Dr Abd Latif Mohmod telah membuat lawatan ke Kompleks Penyayang BAKTI Sungai Buloh di Bandar Sri Damansara pada 24 Februari. Rombongan tersebut disambut oleh Pengurusnya, Puan Siti Muslimah Ibrahim bersama kakitangan dan warga emas di Pusat Jagaan Harian Warga Tua. Rombongan tersebut telah menyampaikan cenderahati dan angpau kepada warga emas di pusat kebajikan tersebut. Selain itu, acara penanaman pokok turut diadakan di perkarangan kompleks oleh Dato' Dr Abd Latif diikuti oleh lawatan ke kompleks dan majlis beramah mesra bersama-sama penghuni Penyayang BAKTI.

Lawatan tersebut ialah sebahagian daripada program tanggungjawab sosial FRIM yang dibiayai oleh tabung kebajikan FRIM untuk menyemai rasa kasih sayang dan tanggungjawab bersama dalam usaha menyumbang kepada kebahagiaan mereka yang kurang bernasib baik. Rombongan FRIM turut meluangkan masa untuk menyertai permainan congkak dan karaoke. Kompleks Penyayang BAKTI Sungai Buloh, sebuah pusat kebajikan kerajaan yang ditubuhkan sejak tahun 2003, mempunyai 15 warga emas dan 38 orang kanak-kanak di bawah jagaannya.



KP FRIM bersarapan pagi bersama-sama penghuni rumah bakti  
The FRIM DG having breakfast with residents of the home

## Pengiktirafan kepada warga kerja yang terlibat dalam penyelidikan getah

FRIM telah mengadakan Majlis Penghargaan "Mahathir Science Award" pada 29 Januari sebagai penghargaan kepada para penyelidik termasuk bekas warga kerjanya di atas sumbangan mereka dalam penyelidikan kayu getah. FRIM telah menerima anugerah "Mahathir Science Award 2009" pada 28 September 2009 daripada Akademi Sains Malaysia sebagai pengiktirafan perannya dalam pembangunan industri perabot kayu getah.

Ketua Pengarah FRIM, Dato' Dr Abd Latif Mohmod telah menyampaikan sijil penghargaan serta cenderahati kepada 20 penerima termasuk mantan Ketua Pengarah FRIM, Tan Sri Dr Salleh Mohd Nor, di majlis yang diadakan di FRIM. Antara

## FRIM staff bring cheer to old folk

FRIM staff led by the Director General Dato' Dr Abd Latif Mohmod paid a visit to the senior citizen centre at Kompleks Penyayang BAKTI Sungai Buloh in Bandar Sri Damansara on 24 February to bring cheer to the residents. The delegation was given a warm reception at the Senior Citizen's Day Care Centre by the manager Madam Siti Muslimah Ibrahim. The FRIM delegates distributed gifts and *angpau* to the senior citizens after the welcome ceremony. This was followed by a tree planting ceremony by the DG near Rumah Tunas Budi.

FRIM delegates were also given a tour around the centre. They also spent time chatting with the residents, as well as joining them in playing some indoor games and in a karaoke session. The visit was part of FRIM's Corporate Social Responsibility programme funded by its own welfare fund, aimed at promoting compassion, generosity and togetherness whilst contributing to the enhancement of happiness and well-being of others who are less fortunate. Kompleks Penyayang BAKTI Sungai Buloh, a government-run welfare home established in 2003, houses 15 senior citizens and 38 children.



KP FRIM menanam pokok di kawasan Kompleks Penyayang BAKTI  
The FRIM DG planting a tree at the home premise

## Recognition to current and ex-staff involved in rubberwood research

FRIM held an appreciation ceremony on 29 January to acknowledge the contribution of its former and current staff involved in the rubberwood research and development (R&D), which had led to the Institute being conferred the Mahathir Science Award 2009. FRIM received the award from the Academy of Sciences Malaysia on 28 September 2009 in recognition of its significant role in the development of the country's rubberwood furniture industry.

At the appreciation ceremony held at FRIM, Dato' Dr Abd Latif presented certificates and tokens of appreciation to 20 recipients led by the former FRIM DG Tan Sri Dr Salleh Mohd Nor. Among the retirees present were Mr Peh Teik Bin, Mr

penerima anugerah tersebut termasuklah En Peh Teik Bin, En Wong Wing Chong, En Hong Lay Thong, En Chong Kwong Food, En G Gucharan Singh dan En Khoo Kean Choon. Dato' Dr Abd Latif juga menyampaikan ucapan terima kasih kepada semua yang terlibat atas sumbangan mereka.

Wong Wing Chong, Mr Hong Lay Thong, Mr Chong Kwong Foo, Mr G Gucharan Singh and Mr Khoo Kean Choon. The DG took the opportunity to express his heartfelt gratitude to all of them.



Dato' Dr Abd Latif (kiri) menyampaikan sijil dan cenderahati kepada Tan Sri Dr Salleh (kanan)  
Dato' Dr Abd Latif (left) presenting Tan Sri Dr Salleh (right) with the certificate and token of appreciation at the ceremony



Gambar berkumpulan yang diambil selepas majlis tersebut  
Group photograph taken at the end of the ceremony

### **Green Cycle II**

Seramai 370 pengayuh basikal lasak berusia antara 12 hingga 64 tahun telah berkumpul di kampus FRIM untuk menyertai program *Mini Jamboree Mountain Bike Green Cycle II* yang diadakan sempena sambutan Ulang Tahun ke-25 FRIM dan Hari Alam Sekitar Sedunia tahun ini. Program tersebut bertujuan mempromosi sukan rekreasi yang telah bertapak di FRIM semenjak tahun 1993 di kalangan warga Malaysia. Selain itu, ia juga bertujuan meningkatkan kesedaran awam tentang apa yang ditawarkan oleh FRIM kepada pengunjung sebagai sebuah institut penyelidikan hutan tropika yang unggul, destinasi pelancongan yang menarik serta taman rekreasi yang popular.

Dua ratus pengayuh pertama yang berjaya menamatkan kayuhan mereka telah menerima pingat sebagai tanda penghargaan penyertaan mereka. Setiap peserta juga menerima nombor plat khusus, baju-T dan beg barangan penaja semasa pendaftaran.

### **Green Cycle II**

A total of 370 mountain bikers, aged 12 to 64, gathered at FRIM in Kepong on 6 June to take part in the Green Cycle II event, held in conjunction with the celebration of FRIM's 25th Anniversary and World Environment Day this year. The objectives of the event were to promote mountain biking as a hobby amongst Malaysians and to enhance public awareness of what FRIM has to offer visitors, not only as a premier research institute, but also as a top tourist destination and a popular recreational site.

The first 200 bikers who completed the 30-km journey were given a medal each in recognition of their participation. All the participants received a goody bag with a T-shirt, plate number and bottled water.



Pelepasan oleh KP FRIM  
Flagging off by the FRIM DG



Seorang peserta menerima bantuan daripada rakan beliau  
A biker receiving help from another



### Program Perniagaan Pelancongan Hijau Malaysia

FRIM juga telah dipilih untuk bekerjasama dengan Biro Konvensyen dan Pameran Malaysia (MyCEB) dalam pelaksanaan Program Perniagaan Pelancongan Hijau Malaysia. Program yang menggalakkan delegasi antarabangsa pada acara yang diadakan di Malaysia memberikan sumbangan kecil bagi tujuan penanaman pokok ini telah bermula dengan acara Kongres Akauntan Sedunia ke-18 yang berlangsung pada 8 hingga 11 November 2010 di Pusat Konvensyen Kuala Lumpur.

### Malaysia Business Tourism Green Programme

FRIM has been selected to work with the Malaysian Convention and Exhibition Bureau (MyCEB) on its Malaysia Business Tourism Green Programme. The program, aimed at encouraging participants of conferences held here to contribute to greening the country, kick-started at the 18<sup>th</sup> World Congress of Accountants, from 8 to 11 November at the Kuala Lumpur Convention Centre (KLCC).

**AKTIVITI-AKTIVITI TANGGUNGJAWAB SOSIAL KORPORAT**  
**CORPORATE SOCIAL RESPONSIBILITY ACTIVITIES**

BIL. NO.	TAJUK TITLE	TARIKH DATE
1	Ekspedisi <i>Duke of Edinburgh's International Award</i> <i>Duke of Edinburgh's International Award Expedition</i>	7-9 Januari / January
2	Gotong royong di Tanjung Lipat, Likas, Sabah <i>Gotong royong at Tanjung Lipat, Likas, Sabah</i>	24 Januari / January
3	Lawatan ke Kompleks Penyayang BAKTI Sg. Buloh, Sri Damansara <i>Visit to Kompleks Penyayang BAKTI Sg. Buloh, Sri Damansara</i>	24 Februari / February
4	Majlis Penghargaan Anugerah Sains Mahathir <i>The Mahathir Science Award Appreciation ceremony</i>	29 Februari / February
5	Sambutan Hari Perhutanan Sedunia <i>World Forestry Day celebration</i>	21 Mac / March
6	Anugerah APECP Excellent Child Contributor 2009/2010 <i>APECP Excellent Child Contributor 2009/2010 Award</i>	31 Mac / March
7	Program Bulan Kesihatan <i>Health Month Programme</i>	1, 15 & 23 April
8	Mesyuarat terkumpul Puspanita FRIM <i>FRIM Puspanita Annual Meeting</i>	21 Mei / May
9	Perasmian Pusat Pendidikan Alam Sekitar FRIM <i>The opening ceremony of FRIM Environment Education Centre</i>	3 Jun / June
10	FRIM MTB Mini Jamboree "Green Cycle II"	6 Jun / June
11	Lawatan sambil belajar anak-anak kakitangan FRIM ke Putrajaya <i>Educational visit of FRIM staff member's children to Putrajaya</i>	17 Jun / June
12	Mesyuarat dan Lawatan Puspanita NRE <i>Meeting and visit from NRE Puspanita</i>	1, 12 & 13 Julai / July
13	Kelab Hoo-hoo – Larian Hari Alam Sekitar Sedunia <i>Hoo-hoo Club- World Environmental Day Run</i>	14 Julai / July
14	Karnival Islam <i>Muslim carnival</i>	7 Ogos / August
15	Ceramah Bulan Kemerdekaan dan Bulan Ramadhan <i>Independence and Ramadhan Months celebration</i>	2 September
16	Lawatan FRIM ke Hospital Selayang <i>FRIM visits to Selayang Hospital</i>	7 September
17	Frost & Sullivan – "Frost the Trail"	17 Oktober / October
18	Majlis Makan Malam Jasamu Dikenang <i>"Jasamu Dikenang" Dinner</i>	21 Oktober / October
19	SK TTDI (1) – Gotong Royong di FRIM <i>SK TTDI (1) – Gotong Royong at FRIM</i>	31 Oktober / October
20	Majlis Pengisytiharan FRIM sebagai Tapak Warisan Semula Jadi <i>Declaration of FRIM as Natural Heritage Site ceremony</i>	18 November
21	"Larian Alam" Kolej Pembelajaran <i>Advanced Learning College "Nature Run"</i>	21 November
22	Lawatan ke Pameran MAHA 2010 <i>Visit to MAHA 2010 Exposition</i>	2 Disember / December
23	Puspanita FRIM (Pertandingan Memasak Jaguh Kampung) <i>FRIM Puspanita (Jaguh Kampung Cooking Competition)</i>	26 Disember / December

**AKTIVITI PENANAMAN POKOK**  
**TREE PLANTING ACTIVITIES**

<b>BIL. NO.</b>	<b>TAJUK TITLE</b>	<b>TARIKH DATE</b>
1	KLCC Convention Centre	31 Mac / March
2	Fitness First Asia	13 Mei / May
3	Omron Electronics Sdn Bhd	15 Mei / May
4	Panasonic AVC Network KL (M) Sdn Bhd	31 Julai / July
5	HSBC Bank Malaysia Berhad	7 Ogos / August
6	TDATA Corporation (Malaysia) Sdn Bhd	25 September
7	ExxonMobil	16 Oktober / October
8	Alliance Bank Malaysia Berhad	23 Oktober / October
9	Citi Malaysia	23 Oktober / October
10	The 9th Asian Congress on Oral and Maxillofacial 2010 —organised by the Malaysian Association of Oral and Maxillofacial Surgeons	31 Oktober / October
11	UMW Petrodril (Malaysia) Sdn Bhd	13 November
12	Maybank Finance and Treasury	20 November
13	Allied Marine & Equipment Sdn Bhd	27 November

## HARI ANUGERAH DAN SAMBUTAN ULANG TAHUN KE-25 FRIM FRIM AWARDS DAY AND 25TH ANNIVERSARY CELEBRATION

FRIM telah menyampaikan pelbagai anugerah kepada warga kerjanya sebagai pengiktirafan terhadap sumbangan, khidmat cemerlang serta pencapaian mereka sepanjang satu tahun lalu di Majlis Hari Anugerah pada 18 Jun. Di majlis tersebut, FRIM turut menyampaikan Anugerah Lembaga MFRDB kepada dua orang bekas Timbalan Ketua Pengarahnya iaitu Prof Dato' Dr Wan Razali Wan Mohd dan Dr Francis SP Ng. Timbalan Ketua Setiausaha II NRE, Dato' Haji Azmi Che Mat yang mewakili Ketua Setiausaha, Dato' Zool Azha Yusof telah merasmikan majlis tersebut.

Timbalan Ketua Pengarah (Operasi) Dr Abdul Rahim Nik telah menerima Anugerah Ketua Pengarah manakala Dr Shamsudin Ibrahim, Pengarah Bahagian Perhutanan dan Alam Sekitar, dan Dr Saw Leng Guan, Pengarah Bahagian Biodiversiti Hutan, merupakan penerima Anugerah Saintis Terbaik. Dua projek penyelidikan diberi Anugerah Penyelidikan Terbaik iaitu Penyelidikan Penanaman Bakau Teknik Inovatif di Pesisiran Pantai Negara yang diterajui oleh Dr Raja Barizan Raja Sulaiman, dan Pembangunan Teknologi Pengeluaran Papan Lelantai Menggunakan Sisa Batang Kelapa Sawit, diketuai oleh En Hashim Wan Samsi.

Anugerah Pekerja Terbaik Tahunan menjadi milik Dr Noor Azlin Yahya (bagi kumpulan pengurusan dan profesional), Cik Ruziah Ripin (kumpulan sokongan 1) dan En Suhaimi Mohd Eskak (kumpulan sokongan 2). Seramai 28 orang kakitangan FRIM menerima Anugerah Khidmat Cemerlang (Individu), sementara Makmal Kimia Tanah, Bahagian Bioteknologi Perhutanan, yang diketuai Dr Wan Rasidah Wan Abd Kadir dan kumpulan Unit Pembangunan Bahan Baharu, yang diketuai oleh Dr Hamdan Husain mendapat anugerah tersebut bagi kategori kumpulan. Seramai 69 orang penjawat awam menerima anugerah anjakan gaji.

Ketua Pengarah FRIM mendahului senarai 16 orang penerima Anugerah Khidmat Setia setelah 25 tahun berkhidmat. Di samping itu, majlis turut menyaksikan penyampaian anugerah khidmat masyarakat, tesis terbaik, penerbitan terbaik, insentif penerbitan di dalam jurnal terkenal atau mempunyai faktor impak tinggi serta kecemerlangan dalam bidang sukan (lihat senarai). Tan Sri Dr Salleh Mohd Nor, mantan Ketua Pengarah FRIM telah melancarkan buku tulisan beliau yang berjudul, "A Journey Down Memory Lane: My Times in FRIM."

FRIM presented various awards to its staff in recognition of their outstanding performance, contributions and achievements over the past one year at its Annual Awards Ceremony on 18 June. The Institute also presented the Malaysian Forestry Research and Development Board (MFRDB) Award to two former Deputy Director-Generals (DG), Prof Dato' Dr Wan Razali Wan Mohd and Dr Francis SP Ng. The annual event was officiated by the Deputy Secretary General II of NRE, Dato' Haji Azmi Che Mat, on behalf of the Secretary General Dato' Zool Azha Yusof.

Deputy Director General (Operations), Dr Abdul Rahim Nik received the Director General's Award this year, while Forestry and Environment Division Director Dr Shamsudin Ibrahim and Forest Biodiversity Division Director, Dr Saw Leng Guan received the FRIM Best Scientist Award. The Best Research Award went to two teams—one, for the Innovative Coastal Mangrove Replanting Technique, led by Dr Raja Barizan Raja Sulaiman, and the other, for the Development of Technology for the Production of Engineered Flooring from Oil Palm Trunk, led by Mr Hashim Wan Samsi.

The Best Worker Award recipients were Dr Noor Azlin Yahya (for the management and professional category), Ms Ruziah Ripin (support group 1) and Mr Suhaimi Mohd Eskak (support group 2). A total of 28 staff members received the Excellent Service Award (Individual), while the FRIM Soil Chemistry Laboratory team led by Dr Wan Rasidah Wan Abd Kadir and New Material Development Unit led by Dr Hamdan Husain received the award for group category. Also, 69 staff members were awarded special salary increments.

The DG topped the list of 16 people who received the FRIM Loyal Service Award for completing a total of 25 years of service. Among others, the ceremony also saw the presentation of awards for community service, the best thesis, the best publication, incentive for publication in renowned or high impact factor journals as well as for excellence in sports (see the list). Among others, Tan Sri Dr Salleh launched his book entitled *A Journey Down Memory Lane: My Times in FRIM* at the ceremony.

**A. Anugerah MFRDB/MFRDB Award**

- *Prof Dato' Dr Wan Razali Wan Mohd*
- *Dr Francis SP Ng*



**A**



**B**

Prof Dato' Dr Wan Razali Wan Mohd (A) and Dr Francis SP Ng, (B) mantan Timbalan-Timbalan Ketua Pengarah FRIM menerima Anugerah MFRDB  
Prof Dato' Dr Wan Razali Wan Mohd (A) and Dr Francis SP Ng, (B) FRIM's former Deputy Director Generals received the MFRDB Award

**B. Anugerah Ketua Pengarah/Director General Award**

- *Dr Abdul Rahim Nik*



### C. Anugerah Saintis Terbaik/Best Scientist Award

- Dr Shamsudin Ibrahim
- Dr Saw Leng Guan



A



B

Dr Shamsudin Ibrahim (A) dan Dr Saw Leng Guan (B) menerima Anugerah Saintis Terbaik daripada Dato' Azmi Che Mat  
Dr Shamsudin Ibrahim (A) and Dr Saw Leng Guan (B) received the Best Scientist Award from Dato' Azmi Che Mat

### D. Anugerah Penyelidikan Terbaik/ Best Research Award

- Penyelidikan Penanaman Bakau Teknik Inovatif di Pesisiran Pantai Negara (Research on Bakau Innovative Planting Technique at National Coastal Areas) (Bahagian Perhutanan dan Alam Sekitar/Forestry and Environment Division):  
Dr Raja Barizan Raja Sulaiman (Ketua/Head)  
Siti Normaslina Tarli                      Wan Adenan Wan Ishak  
Zamri Mohd Zain                              Abu Bakar Md Razali  
Mohd Afendi Abdul Ghani                  Maskom Peseri  
Hamidul Muhsi Mohd Salleh                Mukhtar Ismail
- Pembangunan Teknologi Pengeluaran Papan Lelantai Menggunakan Sisa Batang Kelapa Sawit (Bahagian Keluaran Hutan/Forest Products Division):  
Hashim W.Samsi (Ketua/Head)  
Puad Elham                                      Jalali Saleh  
Dr Rahim Sudin                                 Rosly Mat Joha  
Zaihan Jalaludin



Antara penerima Anugerah Penyelidikan Terbaik  
One of the Best Research Award recipients

**E. Anugerah Pekerja Terbaik Tahunan/ Best Employee Award**

Kumpulan Pengurusan dan Profesional  
Management and Professional Group  
*Dr Noor Azlin Yahya*

**Kumpulan Sokongan 1**  
**Support Group 1**  
*Ruziah Ripin*

**Kumpulan Sokongan 2**  
**Support Group 2**  
*Suhaimi Mohd Eskak@Khairi*



Dr Noor Azlin menerima Anugerah Pekerja Terbaik bagi Kumpulan Pengurusan dan Profesional daripada KP Dr Noor Azlin received the Best Employee Award for the Management and Professional Group from the DG



Ruziah Ripin bersama-sama Sijil Pekerja Terbaik bagi Kumpulan Sokongan I Ruziah Ripin with the Best Employee Award for the Support Group I certificate



Suhaimi Mohd Eskak dipilih sebagai penerima Anugerah Pekerja Terbaik bagi Kumpulan Sokongan 2  
Suhaimi Mohd Eskak elected as the Best Employee Award recipient for the Support Group 2

## F. Anugerah Perkhidmatan Cemerlang—Individu

### Excellent Service Award—Individual

*Dr Gan Kee Seng*

*Dr Laurence Gordon Kirton*

*Dr Noor Azlin Yahya*

*Dr Lillian Chua Swee Lian*

*Dr Elizabeth Philip*

*Dr Salmiah Ujang*

*Dr Mohamad Omar Mohamad Khaidzir*

*Nor Azman Hussein*

*Dr Ling Sui Kiong*

*Lok Eng Hai*

*Ahmad Fauzi Mohd. Shariff*

*Ruziah Ripin*

*Zanariah Nasaruddin*

*Amir Saaiffudin Kassim*

*Abd Azhan Shah Idris*

*Azmarizawati Zainal Azhar*

*Musni Abdul Mois*

*Zaiton Saleh*

*Asman Alias*

*Rabiatun Adawiyah Abu Bakar*

*Zakiah Mohamed*

*Nazima Ayub*

*Roshafiza Mohamad*

*Amran Haron*

*Zairi Sudin*

*Suhaimi Mohd Eskak@Khairi*

*Wan Adanan Wan Ishak*

*Zamri Ahmad*



A



B



C

Dr Ling Sui Kiong(A), Abd Azhan Shah Idris (B) dan Zairi Sudin (C), antara penerima Anugerah Perkhidmatan Cemerlang Individu  
Dr Ling Sui Kiong(A), Abd Azhan Shah Idris (B) dan Zairi Sudin (C), among the Individual Excellent Service Award recipients

## G. ANUGERAH PERKHIDMATAN CEMERLANG—KUMPULAN

### EXCELLENT SERVICE AWARD—GROUP

- Makmal Kimia Tanah/Soil Chemistry Laboratory

(Bahagian Bioteknologi Perhutanan/  
Forest Biotechnology Division)

*Dr Wan Rasidah Wan Abd Kadir (Ketua/Head)*

*Rozita Ahmad*

*Azizah Ariffin*

*Wan Hasan Wan Adnan*

*Mohamad Saidin Kamaluddin*

*Mohamad Izwan Jaimi*

*Nur Harneena Daud*

- Unit Pembangunan Bahan Baru/Development of New Material Unit

(Bahagian Keluaran Hutan/Forest Products Division):

*Dr Hamdan Husain (Ketua/Head)*

*Dr Mohd Khairun Anwar Uyup*

*Mohd Yatim Abd Aziz*

*Abdul Hamid Saleh*

*Nooraznizam Ahmad*

*Ana Azrena Ramly*

*Mohamad Saidin Kamaluddin*

*Othman Mohd. Desa*

*Nur Harneena Daud*

*Nurul Faihira Kamaruzaman*



A



B

Kumpulan penjawat awam dari Makmal Kimia Tanah (A) dan Unit Pembangunan Bahan Baru (B) dianugerahi Anugerah Khidmat Cemerlang—Kumpulan  
 The Soil Chemistry Laboratory (A) and the Development of New Material Unit (B) staff members were awarded the Excellent Service Award—Group

## H. ANUGERAH ANJAKAN GAJI/ SALARY INCREMENT AWARD

*Dr Hashim Md Noor  
Dr Norlia Basherudin  
Dr Nor Hasnida Hassan  
Ahmad Nazarudin Mohd Roseli  
Nik Zanariah Nik Mahmood  
Dr Getha Krishnasamy  
Farah Fazwa Mohd Arif  
Dr Ho Wai Mun  
Chew Ming Yee  
Nada Badaruddin  
Zaitun Said  
Abdull Rashih Ahmad  
Mohd Ramly Mohd Saleh  
Mohd Hasan Buang  
Nik Yasmin Nik Yahya  
Sabariah Sani  
Sharifah Talib  
Mohd Shukri Said  
Asnah Hashim  
Azlina Azit  
Mohd Shahid Mohd Mustafa  
Nor Rashidah Mustafa  
Samsul Bahrin Abdullah  
Anida Zakaria  
Mohd Faizul Mohd Shukari  
Mus'ab Mohd Azahar  
Saiful Nizam Samrin  
Fatimah Abd Azid@Abd Aziz  
Mohd Zulfadli Mat Yasin  
Zakaria Yusof  
Abu Bakar Md Razali  
Ahmad Hasim  
Mohd Nazri Mohd Alis  
Jamaluddin Osman  
Mohd Yusoff Abdul Razak*

*Rosman Ibrahim  
Maskom Peseri  
Ahmad Sabri Othman  
Muhammad Kamaruzzaman Nawawi  
Mohd Azmi Omar  
A Roslee Radzali  
Mohd Latif Md Fuadi  
Mahamad Sakri Ismail  
Mohd Zaini Adam  
Ehwan Nasser Hamsan  
Mohamad Alhad Salleh  
Angan Atan  
Jamil Osman  
Zaisatul Khairy Salleh  
Azman Shah Ramlee  
Azmi Mat Isa  
Rosli Abdul Majid  
Nazri Mohamad  
Saiful Shahrizan Abdul Majid  
Nor Shahimi Yusop  
Azahar Abdullah  
Shamizam Sharif  
Sumardi Husin  
Noorazarifah Mohd Nor  
Zulkifile Md Isa  
Noor Satira Mokhtar  
Mohd Shahrul Amin Mat Shahrudin  
Hamidul Muhsi Mohd Salleh  
Kamaruddin Ismail  
Mohd Farizth Nor Afandi  
Zaiton Mohamad  
Mohd Taufik Maimon  
Mohd Muflif Mohd Rodzi*

**I. ANUGERAH KHIDMAT MASYARAKAT  
COMMUNITY SERVICE AWARD**

*Dr Rahim Sudin*

*Mohd Yatim Abd Aziz*



Dr Rahim Sudin dan Mohd Yatim Abd Aziz, penerima Anugerah Khidmat Masyarakat

Dr Rahim Sudin dan Mohd Yatim Abd Aziz, the Community Service Award recipients

**J. ANUGERAH KHIDMAT SETIA  
LOYAL SERVICE AWARD**

*Dato' Dr Abd Latif Mohmod*

*Dr Woon Weng Chuen*

*Abd Razak Othman*

*Dr Wan Rasidah Wan Abd Kadir*

*Adnan Mohammad*

*Mohamad Lokmal Ngah*

*Mohd Ghazali Hasan*

*Yaacob Zahari*

*Sadali Sahat*

*Jamaludin Malek*

*Zaliha Che Muda*

*Siti Baizurah Osman*

*Shah Mohd Darus*

*Rosidi Sulaiman*

*Kamal Bahrin Mahbok*

*Roslan*

## K. ANUGERAH TESIS TERBAIK/BEST THESIS AWARDS

### KATEGORI/CATEGORY: PH.D.

#### Tesis Terbaik/Best Thesis

- *Dr Siti Salwana Hashim (Bhg Bioteknologi Perhutanan/Forest Biotechnology Division, Universiti Kebangsaan Malaysia)*  
Kajian genetik dua entiti sesenduk (*Endospermum diadenum* (Miq.) Airy Shaw) di Semenanjung Malaysia

#### Anugerah Merit/Merit Award

- *Dr Ismail Parlan (Bhg Perhutanan dan Alam Sekitar/Forestry and Environment Division, Universiti Kebangsaan Malaysia)*  
Phenology, habitat specialization and reduced impact logging of *Gonystylus bancanus* (Miq.) Kurz in Pekan Forest Reserve, Pahang

### KATEGORI/CATEGORY: M.Sc.

#### Tesis Terbaik/Best Thesis

- *Wen Yin Ping (Universiti Putra Malaysia) Secondary metabolites from pepper (*Piper nigrum*) and Tahitian Noni (*Morinda citrifolia*) and their biological activities*

#### Anugerah Merit/Merit Award

- *Sun Wan Fong (Bhg. Bioteknologi/Biotechnology Division/Universiti Malaya)*  
*In vitro* induction of polyploidy in *Nepenthes gracilis*

## L. ANUGERAH PENERBITAN/PUBLICATION AWARD

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

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

### Kategori A/Category A: Penerbitan Teknikal/Technical Papers

#### Pertama/ First

*Kevin Ng Kit Siong, Lee Soon Leong & Saneyoshi Ueno*

Impact of selective logging on genetic diversity of two tropical tree species with contrasting breeding systems using direct comparison and simulation methods

#### Kedua/ Second

*LH Tnah, SL Lee & Kevin KS Ng*

Geographic traceability of an important tropical timber (*Neobalanocarpus heimii*) inferred from chloroplast DNA

#### Ketiga/Third

*MY Chew, TL Yao, S Kamarudin & R Kiew*

Exploration, vegetation and a survey of plant life of the Gunung Tera area, Kelantan, Peninsular Malaysia

#### dan/and

*J Zaihan, CAS Hill, S Curling, WS Hashim & H Hamdan*

Moisture adsorption isotherms of *Acacia mangium* and *Endospermum malaccense* using dynamic vapour sorption

## **Kategori B: Penerbitan Separa/Bukan Teknikal**

### **Category B: Semi/Non-Technical Papers**

#### **Pertama/ First**

*MK Anwar, H Hamdan, MT Paridah, B Edi Suhaimi & S Mohd Sapuan*

Modification of plybamboo through resin impregnation

#### **Kedua/ Second**

*U Salmiah, S Salamah & MY Mohd Nor*

Treatment of timber in housing for safe occupation

#### **Ketiga/Third**

*M Samsudin, I Shamsudin, WM Wan Shukri, H Ismail & C Lillian*

Forestry research as a tool for enhancing policy implementation in achieving sustainable forest management in Malaysia

## **Kategori C: Buku**

### **Category C: Books**

#### **Anugerah Merit/Merit Award**

**(Pemenang Bersama/two winners)**

*H Norini, P Ahmad Fauzi, M Mohd Parid & AR Rohana*

Current and future supply of and demand for rubberwood in Malaysia

#### **dan/and**

*M Sreetheran*

Hazardous trees

## **INSENTIF PENERBITAN DALAM JURNAL BERIMPAK FAKTOR DAN TERKEMUKA**

### **INCENTIVE FOR PUBLICATIONS OF PAPERS IN JOURNALS WITH IMPACT FACTOR AND RENOWNED JOURNALS**

#### **KATEGORI INDIVIDU/INDIVIDUAL CATEGORY**

*Dr Ling Sui Kiong*

*Dr Lee Soon Leong*

*Mazura Md Pisar*

*Saiful Azmi Johari*

*Dr Lee Su See*

*Dr Chang Yu Shyun*

*Dr Kevin Ng Kit Siong*

*Tnah Lee Hong*

*Dr Pin Kar Yong*

*Dr Mohd Khairun Anwar Uyup*

*Mastura Mohtar*

*Dr Ng Chin Hong*

*Mohd Rosli Haron*

#### **KATEGORI BAHAGIAN/DIVISION CATEGORY**

#### **Pertama/First**

Tumbuhan Ubatan/Medicinal Plants

#### **Kedua/Second**

Bioteknologi Perhutanan/Forest Biotechnology

#### **Ketiga/Third**

Biodiversiti Hutan/Forest Biodiversity

## N. ANUGERAH SUKAN/SPORTS AWARD

### KEPIMPINAN SUKAN/SPORTS LEADERSHIP

*Dato' Dr Abd Rashid Abd Malik—Tenis & Golf/Tennis & Golf*

### OLAHRAGAWAN/SPORTSMAN

*Abdul Muhaimin Mohd Razali—Badminton*

### OLAHRAGAWATI/SPORTSWOMAN

*Zalina Mustaffa—Ping Pong*

### PENGURUS TERBAIK/BEST MANAGER

*Saiful Iskandar Khalit—Bola tampar Lelaki/Men's Volleyball*

### PASUKAN TERBAIK/BEST TEAM

*Pasukan Bola Tampar Wanita/Women's Volleyball Team*

*Dr Wan Rashidah Wan Abd Kadir (Pengurus/Manager)*

*Dr Serafina Christine Fletcher*

*Patahayah Mansor*

*Raja Aminah Raja Aman Shah*

*Zaiton Mohamad*

*Saizatul Maheran Ramle*

*Nur Harneena Daud*

*Rosmaniza Umar*

*Lili Sahira Husin*

*Maimunah Tompong*

*Asiah Osman*

*Siti Munirah Mat Yunoh*

### SIJIL KECEMERLANGAN/CERTIFICATE OF EXCELLENCE

*Abdul Muhaimin Mohd Razali*

*Firmansyah Julius Syafri*

*Eri Edizamrius Isa*

*Mohamad Izwan Jaimi*

*Mohd Izwane Wahed*

*Haryanti Azman*

*Mohd Shis Ibrahim*

*Saizatul Maheran Ramle*

*Ahmad Norsidar Ab Halim*

*Mohd Faizal Sharuddin*

*Baharuddin Kamaruddin*

*Mohd Zain Mazlan*

*Suhaida Mustafa*

*Zaridah Mohd Zaki*

*Abd Majid Jalil*

*Imin Kamin*

*Mohamad Rosdi Abdul Kadir*

*Muzalina Muhamad*

*Nur Harneena Daud*

*Noor Afiza Azlina Hamzah*

*Salbiah Man*

# PENGURUSAN KEWANGAN FINANCIAL MANAGEMENT

## Pendahuluan

Laporan ini bertujuan untuk menganalisis kedudukan Laporan Kewangan Lembaga bagi tahun berakhir 31 Disember 2010. Tahun 2010 merupakan tahun yang mencabar dalam menguruskan kewangan Lembaga berikutan pemotongan bajet operasi yang besar. Lembaga telah mengambil langkah-langkah penjimatan dan perbelanjaan berhemah bagi memastikan aktiviti penyelidikan yang dirancang tidak terjejas. Langkah-langkah ini terbukti berjaya dan telah memberi kesan yang diharapkan kerana Lembaga terus mencipta kejayaan dalam penyelidikan perhutanan dan pemuliharaan alam sekitar seperti yang dilaporkan. Namun begitu, kesan pemotongan bajet dan keadaan dana pembiayaan R&D yang semakin sukar tetap dirasai dan digambarkan dalam penurunan pendapatan dan perbelanjaan Lembaga bagi tahun di bawah kajian.

## Pendapatan

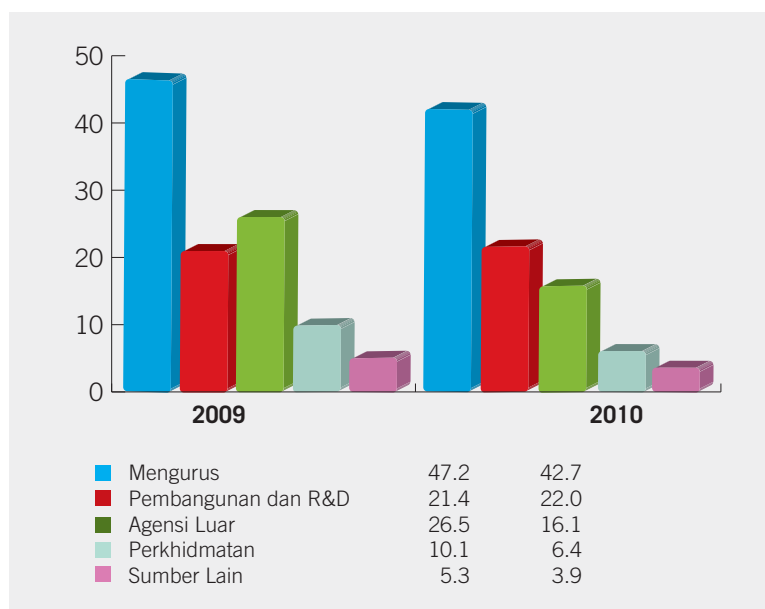
Pada tahun 2010 jumlah pendapatan yang diperoleh Lembaga ialah sebanyak RM91.1 juta iaitu berkurang sebanyak RM19.5 juta berbanding RM110.6 juta pada tahun 2009. Pengurangan tersebut sebahagian besar disebabkan oleh pengurangan sumbangan kerajaan Malaysia sebanyak RM3.9 juta, bayaran perkhidmatan RM3.7 juta dan paling ketara bayaran organisasi luar berjumlah RM16.1 juta iaitu pengurangan sebanyak RM10.4 juta berbanding tahun 2009. Selain itu, pendapatan dari sumber lain turut menunjukkan pengurangan sebanyak RM1.4 juta kepada RM3.9 juta berbanding tahun sebelumnya.

## Introduction

This report analyses Board's financial position for the year ending 31 December 2010. Year 2010 was quite a challenging period in managing the financial resources of the Board arising from a big reduction in operation budget. The Board had taken steps to spend cautiously to ensure all research activities that were planned are not affected. The steps taken proven to be effective and had given the desired results as shown in the achievement of the Board in the year. Nevertheless, the effects of budget cuts and difficulty in sourcing research funding were felt and reflected in the decreased in revenue and also expenditure for the year under review.

## Revenue

For the year 2010, total revenue received by the Board was RM91.1 million decreased by RM19.1 million compared to RM110.6 million in 2009. The decreased was brought about largely to the reduction in government grant by RM3.9 million, services fees received by RM3.7 million and most obvious was contribution from external agencies of RM16.1 million, that is a reduction of RM10.4 million compared to 2009. On top of that, revenue from other sources also recorded a decreased by RM1.4 million to RM3.9 million compared to previous year.



**Rajah 1** Perbandingan Pendapatan Tahun 2009 dan 2010  
**Figure 1** Comparison of revenue for 2009 and 2010

## Perbelanjaan

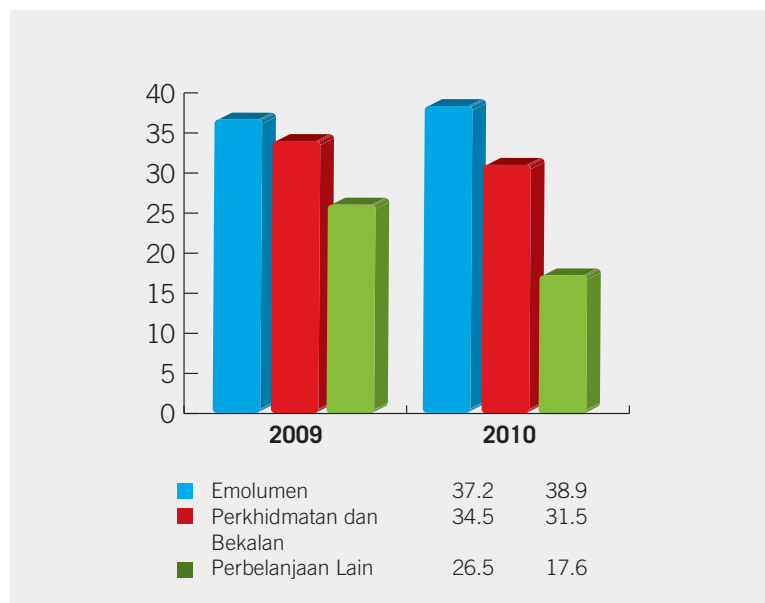
Jumlah keseluruhan perbelanjaan Lembaga dalam tahun 2010 telah menurun kepada RM88.0 juta berbanding RM89.2 juta pada 2009. Lembaga telah membelanjakan sebanyak RM38.9 juta pada tahun 2010 untuk pembayaran emolument meningkat sebanyak 4.6% berbanding tahun sebelumnya.

Perbelanjaan bagi perkhidmatan dan bekalan merekodkan penurunan sebanyak RM3.0 juta iaitu daripada RM34.5 juta pada tahun 2009 kepada RM31.5 juta pada tahun 2010. Bagi perbelanjaan-perbelanjaan lain pula, menunjukkan penurunan ketara sebanyak RM9.0 juta iaitu dari RM26.5 juta pada tahun 2009 kepada RM17.5 juta pada tahun 2010 atau penurunan sebanyak 33.7%.

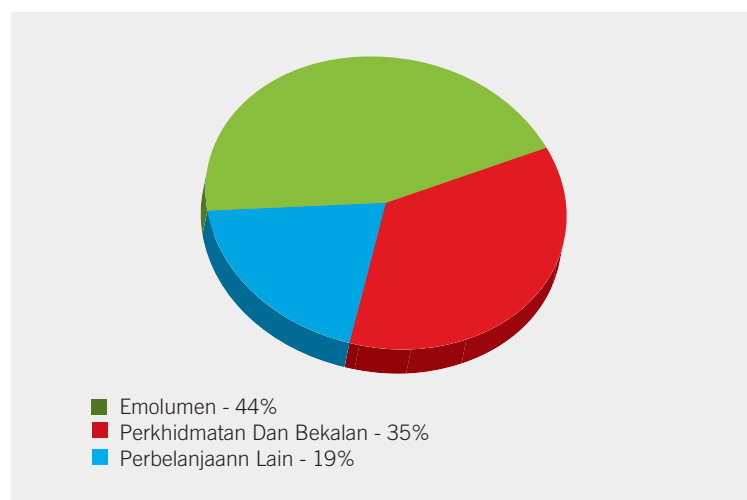
## Expenditure

In total, Board's expenditure for 2010 recorded a decreased to RM88.0 million compared to RM89.2 million in 2009. Out of the total expenditure, RM38.9 million was for emolument expenses, an increased by 4.6% compared to 2009.

Expenditure for supplies and services decreased by RM3.0 million, that is from RM34.5 million in 2009 to RM31.5 million in 2010. On top of that, other expenses also showed obvious reduction of RM9.0 million, which is RM26.5 million in 2009 compared to RM17.5 million in year 2010 or a reduction of 33.7%.



**Rajah 3** Pecahan Perbelanjaan Tahun 2010  
**Figure 3** Fractions of Expenditure in 2010



## Aliran Tunai Dan Pelaburan

Lembaga tiada mengalami masalah aliran dan kecairan tunai dan telah dapat menjelaskan semua tanggungjawab kewangan pada masa yang ditetapkan. Lembaga juga telah melaburkan dana dalam Akaun Amanah Institusi yang dikelolakan oleh Amanah Raya Berhad, dengan kadar dividen kasar boleh terima oleh Lembaga ialah lima peratus (5%) setahun dan tempoh matang pelaburan ialah satu tahun. Jumlah pelaburan bagi tahun semasa adalah sebanyak RM11.9 juta.

## Kunci Kira-Kira

Nilai aset tetap bersih FRIM mencatatkan peningkatan sebanyak RM5.3 juta daripada RM143.3 juta pada tahun 2009 kepada RM148.6 juta berikutan perolehan beberapa harta modal pada tahun semasa. Sementara itu, simpanan tetap menurun sebanyak RM0.7 juta iaitu daripada RM59.3 juta pada tahun 2009 kepada RM58.6 juta pada tahun 2010. Namun begitu, keseluruhan aset Lembaga bagi tahun berakhir 31 Disember 2010 ialah sebanyak RM214.5 juta meningkat berbanding RM213.3 juta pada tahun 2009.

Cukai pendapatan ke atas keuntungan atau kerugian bagi tahun semasa merangkumi cukai semasa serta cukai bagi tahun sebelumnya, yang kesemuanya berjumlah RM0.8 juta berbanding dengan negatif atau terlebih bayar sebanyak RM0.4 juta pada tahun 2009.

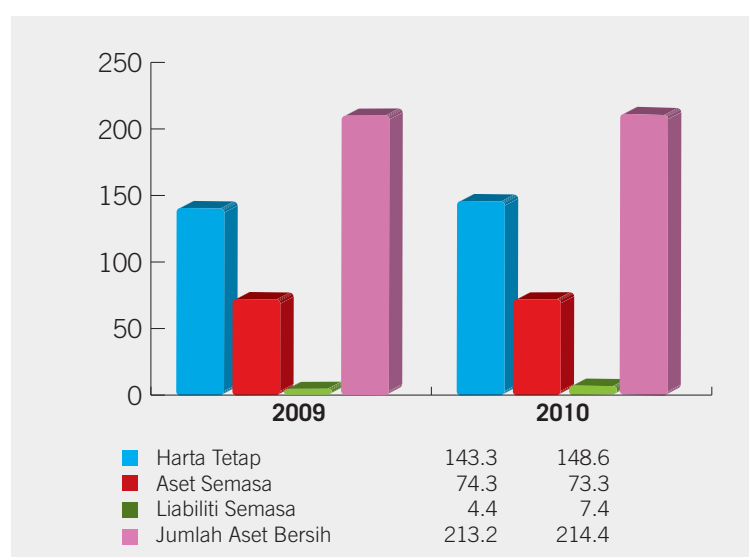
## Cash Flow and Investment

The Board does not have any cash flow or liquidity problems and has always been able to fulfill all financial obligations on time. The Board had invested in Institutional Trust Account managed by Amanah Raya Berhad, with dividends receivable by the Board for five percent (5%) per annum and a maturity period of one (1) year. The total investment for the year was RM11.9 million.

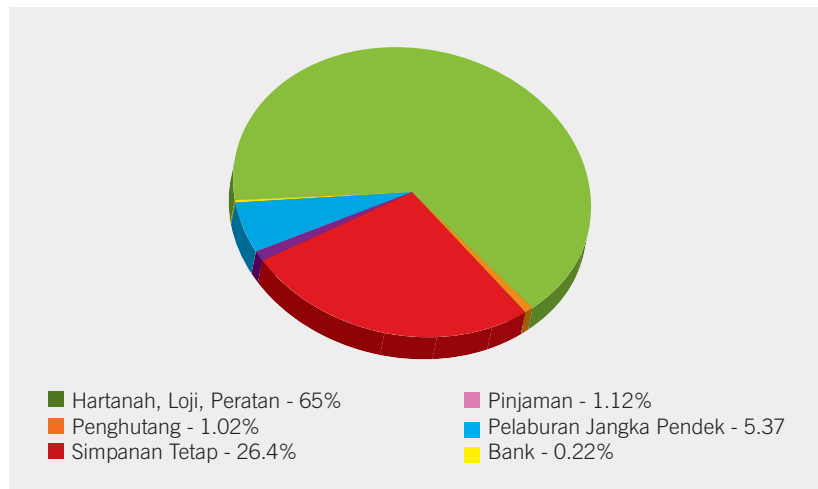
## Balance Sheet

Board's fixed assets showed an increased of RM5.3 million from RM143.3 million in 2009 to RM148.6 million as a result of few capital acquisitions in the year. Meanwhile, fixed deposits decreased by RM0.7 million, which is RM59.3 million in year 2009 to RM58.6 million in 2010. However, in total Board's asset for the year ending 31 December 2010 was RM214.5 million increased as compared to RM213.3 millions in 2009.

Income taxes on profit loss for the years includes all payable taxes, in total of RM0.8 million compared to negative or over payment of RM0.4 million in the year 2009.



Jadual 4 Perbandingan Kunci Kira-Kira Bagi Tahun 2009 dan 2010  
Figure 4 Comparison of Balance Sheet for 2009 and 2010



### Laporan Ketua Audit Negara

Ketua Audit Negara telah memperakukan penyata kewangan Lembaga tahun 2010 dengan memberi sijil bersih dan berpendapat bahawa Penyata Kewangan tersebut memberi gambaran yang benar dan saksama terhadap kedudukan kewangan Lembaga Penyelidikan dan Pembangunan Perhutanan Malaysia pada 31 Disember 2010, hasil operasi dan aliran tunai untuk tahun tersebut berdasarkan piawaian perakaunan yang diluluskan.

### Auditor General's Report

The Auditor General had certified Board Financial Statement for 2010 with clean audit report and in their opinion the statement had given a true and fair view of the financial position of Malaysian Forestry Research and Development Board as at 31 December 2010, its operation and cash flows for that year in accordance with approved accounting standard.

## PERJAWATAN ESTABLISHMENT

Pada 2010, terdapat 886 orang penjawat awam di FRIM. Daripada jumlah ini, 283 orang ialah Pegawai Kumpulan Pengurusan dan Profesional, iaitu 194 orang pegawai penyelidik tetap dan 59 orang pegawai penyelidik kontrak, manakala selebihnya ialah penjawat awam dari Kumpulan Sokongan 1 dan 2. Sebelas orang merupakan Pengarah Bahagian dan 44 orang Ketua Program/Cawangan.

In the year 2010, FRIM had a staff of 886. Out of these 283 were officers from the Management and Professional Group, where 194 were permanent Research Officers and 59 were under contract. The rest were from the Support Groups 1 and 2. There were 11 Divisional Directors and 44 Programme/Branch Heads.

Komposisi Penjawat Awam Staff composition	Bil. No.
Bilangan penjawat awam FRIM Total number of FRIM staff	886
Kategori /Categories Pegawai (JUSA) Officers (JUSA)	15
Pegawai Officers	268
Penolong Pegawai (Kumpulan Sokongan 1) Assistant Officers (Support Group 1)	68
Kakitangan (Kumpulan Sokongan 2) Staff (Support Group 2)	535

## PELANTIKAN

Pada tahun 2010, FRIM telah melantik seramai lima orang Pegawai Penyelidik dan sembilan orang kakitangan Kumpulan Sokongan. Mereka terdiri daripada:

## APPOINTMENTS

In 2010, a total of five new research officers and nine staff members of the support group were appointed. The details are as follows:

	TARIKH LANTIKAN APPOINTMENT DATE
<b>Pegawai Penyelidik Gred Q41</b> <b>Research Officer Grade Q41</b>	
<i>Suharti Samod</i> (Unit Pengurusan Kualiti/Quality Management Unit)	1 April
<i>Suhana Rafidah Md Yusof</i> (Unit Pengurusan Kualiti/Quality Management Unit)	1 April
<i>Nik Adlin Mohamed Sukri</i> (Program Ekopelancongan & Hutan Bandar, Bhg Perhutanan & Alam Sekitar) (Eco-Tourism & Urban Forestry Programme, Forestry & Environment Division)	1 April
<i>Nor Datiakma Mat Amin</i> (Pusat Penemuan Ubatan, Dasar Pengurusan) (Drug Discovery Centre, Management Policy)	1 April

<p><i>Suhaida Mustafa</i> (Program Kesihatan &amp; Pemuliharaan, Bhg Biodiversiti Hutan) (Forest Health and Conservation Programme, Forest Biodiversity Division)</p>	1 April
<p><b>Penolong Pegawai Teknologi Maklumat Gred F29</b> <b>Assistant Information Technology Officer Grade F29</b> <i>Nordaiman Shairi</i> (Bahagian Perkhidmatan Teknikal/Technical Services Division)</p>	4 Januari/January
<p><b>Pembantu Tadbir (Kewangan) Gred W17</b> <b>Administrative Assistant (Finance) Grade W17</b> <i>Mohamad Arni Shah Nira Roswan</i> (Unit Akaun, Bahagian Kewangan /Accounts Unit, Finance Division)</p>	1 Februari/February
<p><b>Juruteknik Komputer Gred FT17</b> <b>Computer Technician Grade FT17</b> <i>Muhamad Jeeфри Govel</i> (Bahagian Perkhidmatan Teknikal/Technical Services Division)</p>	1 Jun/June
<p><b>Pekerja Awam Khas Gred R3 (KPSL)</b> <b>General Worker (Special) Grade R3 (KPSL)</b> <i>Rosli Izhar</i> (Program Membaikbiak Tumbuhan, Bahagian Bioteknologi Perhutanan) (Plant Improvement Programme, Forest Biotechnology Division)</p>	4 Januari/January
<p><b>Pemandu Kenderaan Gred R3</b> <b>Driver Grade R3</b> <i>Zaidi Soit</i> (SPF Mata Ayer, Perlis / Mata Ayer SPF, Perlis)</p>	1 April
<p><b>Pembantu Am Pejabat Gred N1</b> <b>Office General Assistant Grade N1</b> <i>Abdul Azim Mohd Razali</i> (Pejabat Timbalan Ketua Pengarah (Operasi) (Deputy Director General (Operational) Office)</p>	18 Januari/January
	<b>Tarikh Iantikan Appointment date</b>
<p><b>Pegawai Penyelidik Gred Q41</b> <b>Research Officer Grade Q41</b> <i>Kueh Hock Leng</i> (Program Biodiversiti Flora, Bahagian Biodiversiti Hutan) (Flora Biodiversity Programme, Forest Biodiversity Division)</p>	4 Januari/January
<p><b>Pekerja Awam Gred R1</b> <b>General Worker Grade R1</b> <i>Mohd Hafiz Mohd Noor</i> (Cawangan Galeri &amp; Antikuiti, Bahagian Perkhidmatan Teknikal) (Gallery &amp; Antiquity Branch, Technical Services Division)</p>	4 Januari/January
<p><i>Zhafri Ab Ghani</i> (SPF Pasoh, Bahagian Perhutanan &amp; Alam Sekitar) (Pasoh SPF, Forestry &amp; Environment Division)</p>	1 Jun/June

## KENAIKAN PANGKAT

## PROMOTIONS

Seramai 61 orang penjawat awam FRIM telah dinaikkan pangkat pada tahun 2010. Mereka ialah:

A total of a 61 FRIM staff members were promoted in the year 2010. The details are as follows:

<b>PEGAWAI PENYELIDIK GRED 54 RESEARCH OFFICER GRADE Q54</b>	
<b>Nama/ Name</b>	<b>Tarikh/ Date</b>
<i>Abd Razak Othman</i>	1 Januari/January
<i>Dr Abdul Rahman Kassim</i>	1 Januari/January
<i>Dr Nur Supardi Md Noor</i>	1 Januari/January
<i>Dr Richard Chung Cheng Kong</i>	1 Januari/January
<i>Dr Lee Soon Leong</i>	1 Januari/January
<i>Dr Nor Azah Mohd Ali</i>	1 Januari/January
<i>Dr Wan Tarmeze Wan Ariffin</i>	1 Januari/January
<b>PEGAWAI PENYELIDIK GRED 52 RESEARCH OFFICER GRADE Q52</b>	
<i>Dr Hamdan Hussain</i>	1 Mei/May
<i>Dr Ismail Parlan</i>	1 Ogos/August
<b>PEGAWAI PENYELIDIK GRED Q48 RESEARCH OFFICER GRADE Q48</b>	
<i>Asiah Osman</i>	1 Januari/January
<i>Zaihan Jalaludin</i>	1 Januari/January
<i>Sarifah Kunju Ahmad</i>	1 Januari/January
<i>Ong Boo Kean</i>	1 Januari/January
<i>Dr Kevin Ng Kit Siong</i>	1 Januari/January
<i>Dr Nik Musa'adah Mustapha</i>	1 Januari/January
<i>Puad Elham</i>	1 April
<i>Dr Mohd Khairun Anwar Uyup</i>	1 Mei/May
<i>Dr Getha R Krishnasamy</i>	1 Mei/May
<i>Dr Nurhanan Murni Yunos</i>	3 Ogos/August
<b>PEGAWAI PENYELIDIK GRED Q44 RESEARCH OFFICER GRADE Q44</b>	
<i>Zamree Md Shah</i>	1 Januari/January
<i>Norul Maslissa Ahmad</i>	1 Januari/January
<i>Chee Beng Jin</i>	1 Januari/January
<i>Ong Chee Beng</i>	1 Januari/January
<i>Marryanna Lion</i>	1 Januari/January
<i>Nor Hayati Abdullah</i>	1 Januari/January
<i>Saiful Iskandar Khalit</i>	1 Januari/January
<i>Dr Ng Chin Hong</i>	1 Januari/January
<i>Mazura Md Pizar</i>	1 Januari/January
<i>Sreetheran a/l Maruthaveeran</i>	1 Januari/January
<i>Shawn Cheng</i>	1 Januari/January
<i>Mohamad Nasir Mat Arip</i>	1 Januari/January
<i>Saidatul Husni Saidin</i>	1 Januari/January
<i>Chew Ming Yee</i>	1 Januari/January
<i>Dr Sik Huei Shing</i>	1 Januari/January
<i>Latifah Jasmani</i>	1 Januari/January
<i>V Jeyanny Vijayanathan</i>	1 Januari/January

<b>PENOLONG PEGAWAI PENYELIDIK GRED Q32(KHAS UNTUK PENYANDANG)</b> <b>ASSISTANT RESEARCH OFFICER GRADE Q32(PERSONAL TO HOLDER)</b>	
<i>Siti Rafidah Mahmud</i>	26 Oktober/October
<i>Nazaruddin Ramli</i>	1 November
<i>Azahari Mohd Yusof</i>	1 November
<i>Amir Saiiffudin Kasim</i>	1 Disember/December
<b>PEMBANTU PENYELIDIK GRED Q22(KHAS UNTUK PENYANDANG)</b> <b>RESEARCH ASSISTANT GRADE Q22(PERSONAL TO HOLDER)</b>	
<i>Sabariah Sani</i>	22 Ogos/August
<i>Sharul Sa</i>	22 Ogos/August
<i>Zamri Zainuddin</i>	22 Ogos/August
<i>Azman Ahmad</i>	22 Ogos/August
<i>Abd Razak Abd Rahman</i>	22 Ogos/August
<i>Mashilah Mior Ismail</i>	22 Ogos/August
<i>Abu Husin Harun</i>	22 Ogos/August
<i>Zawiyah Ngah</i>	13 Oktober/October
<i>Asman Alias</i>	13 Oktober/October
<i>Mohd Razali Hamat</i>	1 November
<i>Asnah Hashim</i>	1 November
<b>PEMBANTU PERPUSTAKAAN GRED S22(KHAS UNTUK PENYANDANG)</b> <b>LIBRARIAN ASSISTANT GRADE S22(PERSONAL TO HOLDER)</b>	
<i>Fatimah Abd Aziz @ Azid</i>	13 November
<b>PEMBANTU TADBIR (KEWANGAN) GRED W22 (KHAS UNTUK PENYANDANG)</b> <b>ADMINISTRATIVE ASSISTANT (FINANCE) GRED W22(PERSONAL TO HOLDER)</b>	
<i>Rashidah Abd Razak</i>	2 Februari/February
<b>PEMBANTU SETIAUSAHA PEJABAT GRED N22 (KHAS UNTUK PENYANDANG)</b> <b>OFFICE SECRETARIAL ASSISTANT GRADE N22 (PERSONAL TO HOLDER)</b>	
<i>Siti Baizura Osman</i>	15 Disember/December
<b>TUKANG K2 GRED R22</b> <b>K2 CARPENTER GRADE R22</b>	
<i>Mohd Asri Adam</i>	1 Julai/July
<i>A Roslee Radzali</i>	22 Ogos/August
<b>PEMANDU KENDERAAN GRED R6</b> <b>DRIVER GRADE R6</b>	
<i>Jamil Osman</i>	1 Februari/February
<b>PEKERJA AWAM GRED R4 (KHAS UNTUK PENYANDANG)</b> <b>GENERAL WORKER GRADE R4 (PERSONAL TO HOLDER)</b>	
<i>Roslan Abdullah</i>	2 Februari/February
<i>Kamaruddin Ismail</i>	2 Februari/February
<i>Mahat Shumsudin</i>	2 Februari/February
<i>Govinda Rajoo a/l Manikam</i>	2 Februari/February

## PELETAKAN JAWATAN

Pada tahun 2010, seorang Pegawai Penyelidik telah diberi pelepasan dengan izin dan seorang Pegawai Penyelidik telah meletak jawatan. Mereka terdiri daripada:

## RESIGNATIONS

In 2010, one Research Officer and was granted resignations with permission and one Research Officer resigned from the Institute. They are:-

PENJAWAT AWAM STAFF MEMBERS	TARIKH DATE
<b>PELEPASAN JAWATAN DGN IZIN/RESIGNATION WITH PERMISSION</b> <i>Mohamad Jani Saad</i>	1 Februari/February
<b>PELETAKAN JAWATAN/RESIGNATION</b> <i>Phoon Sook Ngoh</i>	1 Januari/January

## PERSARAAN

Seramai sebelas orang kakitangan bersara pada tahun 2010 iaitu:

## RETIREMENTS

Eleven staff members retired in the year 2010. The details are as follows:

PERSARAAN RETIREMENTS	TARIKH DATE
<b>Persaraan Wajib/Mandatory Retirement</b>	
<i>Dr Koh Mok Poh</i>	26 Oktober/October
<i>Dr Chang Yu Shyun</i>	14 November
<i>Ang Khoon Cheng</i>	19 November
<i>Musni Abdul Mois</i>	6 Disember/December
<b>Persaraan Pilihan/Optional Retirement</b>	
<i>Abd Samad Latif</i>	1 Januari/January
<i>Yusof Darus</i>	1 Mei/May
<i>Mohd Rosdy Mohd Taher</i>	1 September
<b>Meninggal Dunia/Deceased</b>	
<i>Mukhtar Ismail</i>	31 Mac/March
<i>Zainon Abu Samah</i>	27 Julai/July
<i>Muhammad Kamaruzzaman Nawawi</i>	8 November
<i>Zainab Bakar</i>	9 November

## LATIHAN TRAININGS

### Latihan Akademik

Pada tahun ini, seramai sembilan orang pegawai FRIM berjaya menamatkan pengajian dari universiti tempatan dan luar Negara. Mereka termasuklah lima pegawai yang berjaya memperoleh ijazah Doktor Falsafah dan empat orang mendapat Ijazah Sarjana.

### 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.

BIL. NO.	NAMA NAME	IJAZAH DEGREE	UNIVERSITI UNIVERSITY
1	Khairul Awang, Dr	Ph.D	Universiti Sains Malaysia
2	Nur Hanan Murni Yunos, Dr	Ph.D	University of Sdney, Australia
3	Mohd Farid Ahmad, Dr	Ph.D	Universiti Sains Malaysia
4	Mohd Zaki Abdullah, Dr	Ph.D	Universiti Putra Malaysia
5	Tnah Lee Hong, Dr	Ph.D	Universiti Malaya
6	Liza Ismail	M.Sc.	Universiti Putra Malaysia
7	Sheeren Haron	M.Sc.	Universiti Kebangsaan Malaysia
8	Norain Mohd Arif	M.Sc.	Universiti Teknologi MARA
9	Nor Datiakma Mat Amin	M.Sc	Universiti Islam Antarabangsa

Bil. Kehadiran kursus/Course attendance > 7 hari/days : P&P/M&P	154
Bil. Kehadiran kursus/Course attendance > 7 hari/days : Sok./Supp. 1	53
Bil. Kehadiran kursus/Course attendance > 7 hari/days : Sok. /Supp. 2	296
Bil. Kehadiran kursus/Course attendance < 7 hari /days : P&P/M&P	25
Bil. Kehadiran kursus/Course attendance < 7 hari /days : Sok./Supp. 1	10
Bil. Kehadiran kursus/Course attendance < 7 hari /days : Sok./Supp. 2	98
Bil. Tidak berkursus/Not attended any courses : P&P/M&P	0
Bil. Tidak berkursus/Not attended any courses : Sok ./Supp. 1	0
Bil. Tidak berkursus/Not attended any courses : Sok ./Supp. 2	10
Bil. Kursus Dalaman (kursus, bengkel, lawatan, ceramah)/ Internal Courses (courses/workshops/visits/talks)	32
*Kemahiran pengurusan/Management Skill	4
*Komunikasi dan penulisan/Communications and Writings	2
*Pembangunan diri/kerjaya/Self/Career Developments	8
*Motivasi/Motivational	-
*Sistem pengkomputeran/Computerization system	4
*Ceramah Umum/Public talks	2
*Lawatan Sambil Belajar /Educational visits	5
*Latihan Kualiti dan Teknikal/Quality & technical trainings	7

Pencapaian/ Achievement	
Bil. Pegawai mengambil PhD (semasa/current)	38
Bil. Pegawai mengambil MSc (semasa/current)	22
Bil. Pegawai mengambil BSc (semasa/current)	1
<b>Jumlah/Total</b>	<b>62</b>
Bil. Pendaftaran Baharu/New registration B.Sc.	0
Bil. Pendaftaran Baharu/New registration M.Sc. (dalam & luar negara/local & overseas)	4
Bil. Pendaftaran Baharu/New registration Ph.D. (dalam & luar negara/local & overseas)	7

Bil. Tamat Pengajian/Completed M.Sc.	4
Bil. tamat pengajian/Completed Ph.D.	5
Bil. telah menjalani sesi viva/Undergone viva session	2
Bil. telah menghantar tesis ke GSO/Theses submitted to GSO	1
Bil. pegawai tidak tamat pengajian dengan jaya/Studies incompleted	2
Sesi pembentangan kertas cadangan pengajian/Presentation of studies proposals	1
Sesi pemantauan ijazah lanjutan/ Post-graduate monitoring session	0
<b>C. Latihan Skim RA/RA Scheme Training</b>	
Bil. RA Skim/RA Scheme (semasa/current)—Ph.D.	4
Bil. RA Skim/RA Scheme (semasa/current)—M.Sc.	16
<b>Jumlah/Total</b>	<b>20</b>
Bil. kursus KKLW/KKLW courses	11
Bil. usahawan yang dilatih (KKLW)/Entrepreneur trained	384
Bil. kursus Induksi Umum (P&P, Sokongan)/Induction Course (Generic) (M&P, Supporting Groups)	18
Bil. peserta Kursus Induksi Umum/Participants of Generic Induction Course	1486
Bil. seminar Penanaman Karas dan Gaharu/Planting of Karas and Gaharu Seminar	0
Bil. latihan anjuran Bahagian lain FRIM/Trainings organized by other Divisions	9

### Latihan Dalaman

Terdapat 10 latihan dalaman telah dianjurkan termasuklah dengan kerjasama agensi luar bagi meningkatkan pengetahuan dan kemahiran penjawat awam FRIM.

### Internal Training

A total of ten internal trainings were organized by FRIM or co-organized with other agencies to enhance FRIM staff knowledge and skills.

BIL. NO.	TAJUK / TITLE	TARIKH / DATE
1	Kursus Ilustrasi Tumbuhan Plants Illustration Course	3-6 Februari/February
2	Bengkel Fotografi Alam Sekitar Environment Photography Workshop	14 Februari/February
3	Bengkel Penulisan Buku Mewah Writing for Coffee Table Book Workshop	24 Februari/February
4	Bengkel Memahami Media Workshop on Understanding the Media	30 Mac/March
5	Bengkel Penilaian & Pemantauan Projek Project Evaluation & Monitoring Workshop	13-15 April
6	Bengkel Pengurusan Tender & Sebut Harga Tender & Quotation Management Workshop	28-30 April
7	Bengkel AOO-EOO AOO-EOO Workshop	16 Julai/July
8	Pola & Proses Diversifikasi Genus Orkid Terrestrial <i>Corybas</i> Patterns & Processes of Diversification in the Terrestrial Orchid Genus <i>Corybas</i>	23 Julai/July
9	Bengkel Perhubungan dengan Media: Kepentingan "5Ws & 1H" Workshop on Dealing with Media: The Importance of 5Ws & 1H	30 Julai/July
10	Bengkel Penyediaan Cadangan Penyelidikan Crafting for Research Proposal Workshop	8-9 September
11	Seminar Penilaian & Pemantauan Projek The Project Evaluation & Monitoring (PEM) Seminar	13-15 April & 9 November

## LATIHAN AWAM

### a. Program Latihan dan Bimbingan Usahawan

Program ini merupakan program kerjasama antara FRIM dan Bahagian Pengupayaan Ekonomi, Kementerian Kemajuan Luar Bandar dan Wilayah (KKLW) yang bertujuan membangunkan sektor industri luar bandar selaras dengan Dasar Perindustrian Negara dan menyumbang kepada pertumbuhan ekonomi supaya lebih produktif dan mampan.

Dalam masa yang sama penglibatan pegawai penyelidik FRIM memberi latihan kepakaran teknikal khususnya dalam bidang bioteknologi dan hortikultur serta penyertaan masyarakat luar bandar diharap dapat ditingkatkan bagi melahirkan masyarakat usahawan luar bandar yang berdaya maju, berdaya saing dan berdaya tahan. FRIM juga dapat membantu negara mencapai matlamat membentuk Masyarakat Perdagangan dan Perindustrian Bumiputera (MPPB) menerusi pemindahan teknologi hasil R&D yang dijalankan.

Antara objektif program ini ialah menggalakkan pengusaha luar bandar mengembangkan perusahaan dan perniagaan. Sementara fungsi utama FRIM adalah untuk menyesuaikan penemuan teknologi baharu dan melatih para usahawan untuk menggunakan teknologi ini dalam perusahaan dan perkhidmatan mereka.

Pada tahun 2010 sebanyak 11 siri kursus telah diadakan di Kuala Lumpur, Kuching dan Kota Kinabalu. Seramai 384 orang peserta yang terdiri daripada bakal-bakal usahawan bumiputera berjaya dilatih dalam bidang teknologi herba, landskap dan tapak samaian. Penyertaan melebihi 25% daripada jumlah yang disasarkan. Program ini akan diteruskan dengan membangunkan modul-modul baharu bagi membantu kerajaan khususnya KKLW dalam mempertingkatkan tahap kehidupan masyarakat berbanding dengan negara-negara luar.

FRIM juga secara tidak langsung mendapat keyakinan dan kepercayaan rakyat khususnya KKLW. Mereka yakin FRIM berkemampuan memberikan yang terbaik terhadap perusahaan dan perkhidmatan mereka. FRIM juga berjaya melahirkan budaya kualiti di kalangan tenaga pengajarnya.

### b. Kursus Induksi Umum

Kursus Induksi ialah Kursus Perkhidmatan yang wajib diambil oleh semua penjawat awam bagi tujuan pengesahan dalam jawatan. Sukatan kursus ini dikeluarkan oleh Jabatan Perkhidmatan Awam dan penganjuran kursus ini dilaksanakan dengan kerjasama INTAN. Menerusi kursus ini FRIM bertanggungjawab memberi pendedahan dan penjelasan kepada semua penjawat awam baharu mengenai sejarah negara, dasar utama kerajaan, rancangan dan program pembangunan

## PUBLIC TRAINING

### a. Entrepreneur Training and Guidance Programme

The Entrepreneur Training and Guidance Programme was implemented in collaboration with the Support Economy Division, Ministry of Rural and Regional Development (KKLW). The goal of the programme is to develop the rural industry sector in line with the National Industrial Policy and to contribute towards an economic growth that is more productive and sustainable.

Concurrently, it is hoped that the involvement and participation of FRIM researchers in giving technical services especially in biotechnology and horticulture, and the involvement of rural communities would be heightened specifically in creating a dynamic, competitive and resilient rural entrepreneurial community. FRIM will also contribute towards creating a Bumiputera Trade & Industries Community (MPPB) in transferring technology by carrying out R&D.

The objective of the programme is to encourage rural Bumiputera entrepreneurs expand their existing businesses/industries. The main function of FRIM, to enhance research and development findings through technology transfer in a new technology, is relevant to providing impact on the rural Bumiputera entrepreneurs businesses and services.

In 2010, FRIM successfully conducted ten series of the Training and Guidance Programme held in Kuala Lumpur, Kuching and Kota Kinabalu. Approximately 384 participants, who were mainly Bumiputera entrepreneurs, completed their courses in Commercial Nursery Establishment; and Landscape and Herbal Technology. The total number of participants was 25% higher than expected. This programme will be continued with new development modules to assist the government, especially the Ministry of Rural and Regional Development (KKLW), in enhancing the standard of living of the rural society comparable with that of other progressive countries.

FRIM also obtained the confidence and trust from many people, especially Ministry of Rural and Regional Development (KKLW) who believe that FRIM has the expertise and capability to give the best services for their businesses. FRIM has successfully promoted a quality culture of working to their trainers in achieving a higher level of training.

### b. Public Induction Course

The induction course is a compulsory service course attended by all government servants in order to confirm their positions. They are required to attend and pass the induction course within three years from the date of reporting duties. The syllabus of the induction course is produced by the JPA and the course organizers collaborate with INTAN. Through the induction course, FRIM is responsible for providing explanations and

negara. Sistem pentadbiran, prosedur utama dan pekeliling kerajaan juga merupakan perkara utama yang perlu ditekankan kepada peserta kursus. Tenaga pengajar terlatih adalah di kalangan pegawai kanan FRIM, Institut Tadbiran Awam Negara (INTAN), JPA, SPRM dan juga pegawai kerajaan yang telah bersara. Pengalaman dan kematangan tenaga pengajar ini diharap dapat dikongsi dengan peserta kursus yang umumnya muda dan kurang pengalaman. Kursus selama enam hari bagi kumpulan sokongan dan sebelas hari untuk kumpulan Pengurusan dan Profesional (P&P) ini juga berjaya memupuk nilai dan etika kerja cemerlang di kalangan para peserta.

Sebanyak 18 siri kursus telah dilaksanakan pada 2010 dengan jumlah peserta seramai 1486 orang dari 33 agensi. Menerusi program ini FRIM berjaya menjana pendapatan sampingan menerusi yuran perkhidmatan. Pendapatan kasar keseluruhan program ini ialah sebanyak RM1 638 480.

Kesimpulannya menerusi dua program di atas Bahagian Sumber Manusia telah berjaya memenuhi aspirasi kerajaan dalam membantu meningkatkan tahap ekonomi para usahawan bumiputera, melatih penjawat awam baru dan menjelaskan konsep 1 Malaysia dalam modul Kursus Induksi yang dilaksanakan di samping memperkasakan pentadbiran latihan khususnya penjawat awam di Cawangan Pembangunan Modal Insan. Secara tidak langsung juga FRIM dapat menjana pendapatan sampingan sebanyak RM390 319 hasil daripada pendapatan kasar kedua-dua program iaitu RM2.4 juta.

exposing all new government servants to the national history, government policies, planning and national development programmes. Administration systems, main procedures and government circulars would also be major subjects to be emphasized to course participants.

Skilful and experienced senior officers are among the facilitators from FRIM, INTAN, BPR and also are retired government officers. A six-day course for the Support group and eleven-day course for the Professional and Management group are organized.

More than 10 series of courses were completed in 2010 with 1570 participants from 33 agencies. Through this programme, FRIM has been able to generate side income from service fees. Overall gross revenue for 2010 was approximately RM 1 638 480 from this programme.

In conclusion, the above two programmes were successful in fulfilling the aspiration of the government in assisting and increasing the level of economy of bumiputra entrepreneurs, training new government servants and explaining the 1 Malaysia concept in new modules of the induction course. Furthermore, they will strengthen the administration of training especially for government servants in the development of human skills. FRIM has managed to generate side/extra income of approximately RM2.4 million gross income derived from the two programmes.

## PELAWAT RASMI OFFICIAL VISITORS

Kejayaan cemerlang FRIM dalam bidang penyelidikan telah menarik minat ramai pelawat rasmi dari dalam dan luar negara untuk datang sendiri menyaksikan kemudahan dan mendapatkan penerangan lanjut tentang aktiviti penyelidikan dan pembangunan yang dijalankan. Jumlah lawatan rasmi ke FRIM telah meningkat daripada 23 pada tahun 2009 kepada 34 pada tahun 2010. FRIM telah merekodkan sejumlah 582 pelawat rasmi yang terdiri daripada orang-orang kenamaan dari dalam dan luar negeri, pegawai-pegawai kerajaan, saintis serta wakil-wakil dari sektor swasta dan badan-badan bukan kerajaan.

FRIM's outstanding achievements in research have attracted many official visitors from within the country as well as overseas to see for themselves its facilities and to seek further information on its research and development activities. The number of official visits to FRIM had increased from 23 in 2009 to 34 in 2010. FRIM recorded 582 official visitors, consisting of local and foreign dignitaries, government officers, scientists and representatives from private sector as well as from non-governmental organizations (NGOs).

BIL. NO.	PELAWAT VISITORS	TARIKH DATE
1	Nestle Products Sdn Bhd	19 Februari / February
2	Agroforestry Improvement Partnership (AFIP) Project Intercooperation Bangladesh	23 Februari / February
3	IUFRO Management Committee Meeting	24-25 Mac / March
4	Jabatan Perangkaan Malaysia Malaysian Statistics Department	31 Mac / March
5	Madame Jiang Zehui, Fellow of International Academy of Wood Science (IAWS), President of Board of International Centre for Bamboo and Rattan (ICBR)	1 April
6	Majlis Daerah Kuala Selangor Kuala Selangor Municipal Council	16 April
7	Menteri Sumber Asli dan Alam Sekitar Singapura Minister of Singapore Natural Resources and Environment	8 Mei / May
8	Jabatan Ukur dan Pemetaan Malaysia (Bahagian Geospacial Pertahanan) Malaysian Survey and Mapping Department (Defence Geospacial Division)	2 Jun / June
9	Mr Jorge Grandi, UNESCO (United Nations Educational, Scientific and Cultural Organization)	22 Jun / June
10	Ms Marti Cortez, Senior Vice President, Visitor Experience and Human Resources, Saint Louise Science Centre	24 Jun / June
11	PUSPANITA NRE/NRE PUSPANITA	30 Jun / June
12	YDP & AJK Tertinggi PUSPANITA Kebangsaan	13 Julai / July
13	Perbadanan Labuan/Labuan Corporation	15 Julai / July
14	Lawatan dan taklimat "Laporan Outcome Pembangunan Pusat Teknologi Herba"	21 Julai / July
15	Ms Mariann Fee (CEO), UoM Commercial Ltd, The University of Melbourne Australia	27 Julai / July
16	Sektor Penilaian dan Pemantauan, Jabatan Perdana Menteri	28 Julai / July
17	Kedutaan Embassy of Democratic People's Republic of Korea in Malaysia	10 Ogos / August
18	YB Peter Nansian Anak Ngusie, Menteri Muda Alam Sekitar Sarawak	16 Ogos / August
19	Dr Yoshifumi Yasuoka, Executive Director of National Institute for Environmental Studies, Tsukuba Dr Toshinori Okuda, Professor Hiroshima University Dr Toshihiro YAMADA Associate Professor Hiroshima University	18 Ogos / August
20	Delegasi dari/Delegation from Vietnam	30 Ogos / August
21	Delegasi dari/Delegation from Kuala Lumpur & Selangor Furniture Entrepreneur Association (KLSFEA)	2 September
22	Delegasi dari/ Delegation from Republik Congo	6 September
23	Delegasi dari/Delegation from WWF Greater Mekong Rattan Programme Policy Study Tour	27 September

24	Koperasi Pembangunan Desa, Sabah	28 September
25	Delegasi dari/Delegation from "MTC Familiarisation Programme for Trade Journalist"	11 Oktober / October
26	CEO of Lords Promotions International Inc., Official Consultants to Forestry Research Institute of Nigeria (FRIN)	12 Oktober / October
27	Delegasi dari/Delegation from MTC Global Timber Woodmart 2010	21 Oktober / October
28	Lawatan YB Hajah Nancy dan Ahli MFRDB ke Ladang Karas	21 Oktober / October
29	Delegasi dari/Delegation from Ahli Parlimen Perancis	4 November
30	Lawatan Kapal Belia Asia Tenggara	12 November
31	Delegasi dari/Delegation from Forest Research Institute of Nigeria (FRIN)	23 November
32	Delegasi dari/Delegation from Universiti Lambung Mangkurat, Banjarbaru, Kalimantan Selatan, Indonesia	2 Disember / December
33	Delegasi dari/Delegation from Korean Forest Research Institute (KFRI)	3 Disember / December
34	Koperasi Pertanian Putatan, Sabah	6 Disember / December
35	Lawatan Penerima Geran MTDC/FRIM	17 Disember / December
36	Bahagian Kewangan MARDI (Lawatan dan taklimat sistem MyAsset)	23 Disember / December



Pelawat dari/Visitors from WWF Mekong

## AKTIVITI-AKTIVITI LAIN OTHER ACTIVITIES

### Perasmian Galeri Penyelidikan FRIM

Muzium dan Galeri Penyelidikan FRIM telah dibuka dengan rasminya oleh Menteri NRE, Dato Sri Uggah Embas pada 25 Mac. Penubuhan galeri penyelidikan ini amatlah bersesuaian dengan usaha FRIM mempertingkatkan usaha penyebaran maklumat tentang pelbagai penemuan dan produk yang dihasilkan menerusi aktiviti-aktiviti penyelidikannya.

Galeri Penyelidikan FRIM ini mempamerkan lebih daripada 60 sampel, model, produk serta prototaip yang dihasilkan melalui aktiviti-aktiviti penyelidikan dan pembangunan (R&D) utama yang dijalankan oleh FRIM selama ini. Bahan-bahan pamerannya termasuk sampel produk herba yang telah dikomersialkan, anak-anak pokok yang dihasilkan melalui teknik kultur tisu, biji benih pokok dipterokarpa dan bukan dipterokarpa dan koleksi serangga yang unik.

Turut dipamerkan ialah 40 buku hasil cetakan FRIM yang terpilih serta yang paling laris dijual, 160 poster penyelidikan dan 50 sijil anugerah yang diterima oleh FRIM sebagai sebuah institusi dan para penyelidikannya. Selain itu, terdapat juga paparan audio visual dan multimedia dengan jaringan internet, untuk meningkatkan impak visual dan menimbulkan suasana ceria dalam proses pembelajaran.

Galeri ini terletak di dalam Muzium FRIM yang ditubuhkan pada tahun 1920-an untuk mempamerkan artifak-artifak sejarah serta hasil penyelidikan FRIM. Muzium FRIM ditutup kepada orang ramai sejak Januari 2009 untuk penambahbaikan dengan penubuhan Galeri Penyelidikan tersebut yang selaras dengan penambahan fungsinya sebagai pusat rujukan dan koleksi setempat bagi hasil-hasil penyelidikan FRIM.

Sebelum ini, jumlah pengunjung ke Muzium FRIM dianggarkan seramai 53 000 orang setahun. Mereka terdiri daripada pelawat dari dalam dan luar negara, termasuk para penyelidik, orang awam, pelajar-pelajar institusi pengajian tinggi dan sekolah menengah, murid-murid sekolah rendah serta tadika. Dengan pembukaan muzium dan galeri ini, jumlah pelawat ke FRIM dianggar akan bertambah dengan lebih banyak lagi.

### Official Opening of FRIM's Research Gallery

The FRIM's new Research Gallery and refurbished museum were officiated by the Minister of NRE, Dato Sri Douglas Uggah Embas on 25 March. The setting up of the research gallery was timely and in line with the ministry's mission and objective, as well as that of FRIM's, to enhance dissemination of research findings to the public.

The new gallery showcases over 60 interesting samples, models, products and prototypes from various R&D activities carried out by FRIM over the years. The exhibits include samples of herbal products, tissue culture plantlets, dipterocarp and non-dipterocarp seeds, and insect collectio.

About 40 of the institute's most saleable publications, 160 research posters and 50 certificates of achievement received by FRIM's scientists will also be displayed for public viewing. In addition, there are audio visual and multimedia presentations with internet connection, to enhance the visual impacts and make learning fun for visitors.

The gallery is located in the FRIM Museum, established in 1920's to display various historical artifacts and products related to forests and forest research. The museum was closed for upgrading and setting up of the gallery since January 2009, in line with its expanded functions to also serve as a one stop collection and reference centre for FRIM research outputs.

Previously, the total number of visitors to FRIM museum was about 53,000 per year. The visitors included researchers, members of the public, local and foreign tourists, university and secondary school students, as well as primary school kids. With the re-opening of the museum and the new research gallery, the number of visitors is expected to increase significantly.



Ketibaan Dato Sri Uggah Embas disambut oleh  
Pegawai-pegawai kanan FRIM  
Dato Sri Uggah Embas arrival was welcomed by  
FRIM's top officials



Majlis perasmian Galeri Penyelidikan FRIM oleh  
Menteri NRE  
Official opening ceremony of FRIM Research Gallery by  
the Minister of NRE



Lawatan ke pameran Pusat Penemuan Ubatan di dalam Galeri  
Visit to the Drug Discovery Centre exhibition booth in the Gallery

## Aktiviti Sukan dan Rekreasi Kelab FRIM

Sempena sambutan Ulang Tahun ke-25 FRIM, Kelab Sukan FRIM telah menjayakan beberapa acara yang melibatkan semua warga FRIM. Antaranya termasuklah Kejohanan Mini Sukan 25 Tahun FRIM, pertandingan memancing (2 Mei), kejohanan bowling piala Dato' KP (7-8 Ogos), hari keluarga dan sambutan hari raya (1-2 Oktober). Selain itu, Kelab FRIM bergiat aktif menjalinkan kerjasama dengan pelbagai agensi dan syarikat swasta untuk menjayakan program sukan, rekreasi dan menghargai alam sekitar seperti program Jacob Walk, Sukan Rakyat dan Hari Alam Sekitar. Dalam kejohanan Mini Sukan FRIM pada 30 April 2010, sebanyak 10 acara sukan rakyat telah dipertandingkan di kalangan kakitangan FRIM dan telah mendapat sambutan yang menggalakkan di kalangan pegawai dan kakitangan FRIM.

In conjunction with FRIM's 25th Anniversary, the Sports Club organized events with the participation of all of FRIM's staff. Among the activities were the Mini Sport Tournament, Fishing, DG's Bowling Cup, Family Day and Hari Raya celebrations. The Club also actively collaborated with various agencies/private companies to organize sports event and recreations such as Jacob's Walk, Family Day and the Environment Day. FRIM Mini Sport was held on 30 April with 10 traditional sports that attracted many staff members to participate.



Pada 2 Mei, satu pertandingan memancing telah diadakan di tasik Taman Botani Kepong. Pertandingan ini telah disertai oleh 400 orang peserta di kalangan warga FRIM serta peserta luar termasuk dari luar Lembah Kelang. Pelbagai acara sampingan telah diadakan iaitu meneka berat ikan, pertandingan mewarna dan pertandingan karaoke. Pertandingan ini telah menyediakan hadiah yang lumayan dengan pemenang pertama menerima hadiah RM 5000 dengan timbangan berat ikan sebanyak 3.92 kg manakala pemenang kedua dan ketiga dengan RM 3000 dan 1000 masing-masing.

On 2 May, a fishing competition was held at Kepong Botanical Garden. About 400 fishing enthusiasts participated in the competition which offered attractive cash prizes. A number of side events were also held such as estimating the weight of fish, a colouring contest and karaoke. In the fishing competition, winner received RM5000 cash prize after successfully catching 3.92-kg kaloi. The second and third winners received RM3000 and 1000 respectively.



### JACOB'S WALK OF LIFE 2010



Pada 25 Julai, Kelab FRIM telah bekerjasama dengan Jacob's untuk menjayakan JACOB's Walk of Life 2010 di Kampus FRIM. Program ini telah dirasmikan oleh YB Datuk Rosnah Haji Abdul Rashid Shirlin, Timbalan Menteri Kesihatan. Program ini disertai seramai 6000 peserta dari seluruh Malaysia.

The Club collaborated with Jacob's (Kraf Malaysia) to organize Jacob's Walk of Life 2010 at FRIM, Kepong on 25 July. The programme was officiated by YB Datuk Rosnah Haji Abdul Rashid Shirlin, the Deputy Health Minister, and attended by about 6000 participants from all over Malaysia.

Satu Kejohanan Bowling 25 Tahun FRIM Bersama Media telah diadakan pada 7–8 Ogos bertujuan untuk menjalin hubungan yang baik antara FRIM dengan pihak media. Sebanyak 10 pasukan jemputan media dan 60 pasukan dari beberapa agensi kerajaan dan swasta telah mengambil bahagian. Endah Parade.

A bowling tournament, so-called Bowling 25th Years with Media, was held from 7–8 August at the Endah Parade to foster good relationship between FRIM and the media. The tournament was participated by 10 media teams and another 60 teams from government and private companies.



Dato' Dr Abd Latif Mohmod merasmikan Kejohanan Bowling Piala Ketua Pengarah FRIM  
 Dato' Dr Abd Latif Mohmod officiated the Bowling Tournament of FRIM Director General's Trophy

Satu program Hari Raya Aidil Fitri dan Hari Keluarga FRIM telah diadakan pada 1–2 Oktober di perkarangan Bangunan Herbarium, FRIM. Berbagai-bagai aktiviti telah diadakan seperti acara membakar lemang dan memasak rendang, sukaneka dewasa dan kanak-kanak, senamrobik, pencarian harta karun, pertandingan mewarna, persembahan antara zon, cabutan nombor bertuah, khemah berhias, peraduan berat ketupat dan gerai jualan. Program ini bertujuan untuk mengeratkan silaturahim dikalangan penjawat awam FRIM dan ahli keluarga. Pelbagai acara sukaneka turut diadakan. Sambil menikmati makan tengahari kakitangan turut dihiburkan dengan persembahan oleh artis jemputan.

FRIM's Family Day was held on 1–2 October at the new Herbarium Building compound as part of Hari Raya Eidul Fitri celebration. Various activities such as preparation of lemang and rendang, telematch, treasure hunt, colouring contest, lucky draw, and ketupat weight estimation were held and booths and decorative tents were set up. The objective of the programme was to foster good relationship among the FRIM's staff and family. The programme was successful with the presence of two invited artists while the staff enjoyed their food.





Pelbagai aktiviti yang diadakan sempena Hari Keluarga FRIM  
Various activities that were held during FRIM's Family Day

## PENERBITAN PUBLICATIONS

Pada tahun 2010, FRIM menerbitkan sejumlah 30 judul baharu. Antaranya ialah empat keluaran *Journal of Tropical Forest Science*, satu jurnal antarabangsa yang mempunyai faktor impak, empat keluaran *FRIM in Focus*, surat berita FRIM dan dua keluaran *Conservation Malaysia*, buletin tentang pemuliharaan tumbuhan dan haiwan di Malaysia. Sebanyak lima judul telah dicetak semula disebabkan permintaan yang menggalakkan. Salah satu judul yang popular ialah *Pocket Check List of Timber Trees* yang digunakan sebagai buku teks di Universiti Pertanian Malaysia, Serdang dan Unit Latihan Perhutanan, Kepong.

Tahun 2010 menyaksikan kemunculan semula buku mewah setelah tempoh yang lama. Buku mewah terakhir yang diterbitkan oleh FRIM adalah pada tahun 2001. Buku berjudul *FRIM: Tapak Warisan Semula Jadi Negara* telah memenangi Hadiah Buku Kebangsaan 2010 di bawah kategori buku teknikal terbaik. Hadiah buku ini diberi kepada FRIM atas usaha giatnya semenjak 2008 untuk menghasilkan penerbitan saintifik yang mudah difahami oleh orang awam. Satu lagi buku mewah iaitu *100 Years of Tropical Forest Research: The Story of the Forest Research Institute Malaysia* mengulas tentang sejarah FRIM semasa era penjajah, Perang Dunia I, kemakmuran getah, kemelesetan ekonomi, Perang Dunia II, penjajahan Jepun, pemulihan selepas perang, darurat dan selepasnya serta menceritakan tentang kejadian, pembangunan, idea dan personaliti yang meninggalkan kesan pada Institut ini dan perhutanan tropika.

Pada 8 Ogos, Kedai Buku FRIM telah menyambut ulang tahunnya yang ke-8. Sempena sambutan ini yang kebetulan disambut pula bersama-sama Ulang Tahun FRIM yang ke-25 dan bulan kemerdekaan, Cawangan Penerbitan telah menganjurkan beberapa aktiviti untuk pembeli di Kedai Buku. Sepanjang bulan Ogos, sebanyak 8739 naskhah buku bernilai jualan RM108 452 telah diberi secara percuma. Selain buku percuma, poskad serta biskut juga telah dihadiahkan kepada pembeli. Selain hadiah percuma ini, pembeli berpeluang mengambil bahagian dalam kuiz yang mengandungi soalan mudah tentang Kedai Buku dan penerbitan FRIM. Hadiah menarik diberikan kepada pemenang acara kuiz.

Cawangan Penerbitan telah menjual buku di seminar/pameran yang diadakan di luar FRIM. Semasa pameran Minggu Alam Sekitar Malaysia, FRIM telah menyahut seruan kerajaan untuk kempen hijau dengan menggunakan beg kertas sahaja.

Katalog Penerbitan diterbitkan pada bulan Februari, April, Ogos dan Oktober untuk tujuan promosi. Salinan elektronik katalog telah diemel kepada sebanyak 52 ejen buku di luar dan dalam negara. Sebanyak sembilan poster penerbitan baharu dicetak dan dipos kepada 380 pelanggan di luar dan dalam negara sepanjang tahun 2010.

In 2010, FRIM published a total of 30 new titles. Among the publications were four issues of *Journal of Tropical Forest Science*, an international refereed journal with impact factor; four issues of *FRIM in Focus*, a quarterly newsletter of FRIM; and two issues of *Conservation Malaysia*, a biannual bulletin supporting plant and animal conservation in Malaysia. Five titles were reprinted due to popular demand. One of the evergreen titles is *Pocket Check List of Timber Trees* which is being used as text book in Universiti Pertanian Malaysia, Serdang and Forestry Training Unit, Kepong.

Year 2010 witnessed the re-emergence of coffee-table books, after a long period. The last coffee-table book published by FRIM was in 2001. The book entitled *FRIM: Tapak Warisan Semula Jadi Negara* won the National Book Award 2010 under the Best Technical Book category. The book award was given to FRIM for its intensified efforts since 2008 to produce scientific publications that are easy to read for public consumption. Another coffee-table book entitled *100 Years of Tropical Forest Research: The Story of the Forest Research Institute Malaysia* guides readers through the history of FRIM during the colonial period, World War I, the rubber boom, the great depression, World War II, the Japanese occupation, the post-war recovery, the Malayan Emergency, Independence and thereafter as well as highlights the many events, developments, ideas and personalities that have made their mark on the Institute and on tropical forestry.

On 8 August 2010, FRIM Bookstore celebrated its Eighth Year Anniversary. In conjunction with its anniversary, which coincided with FRIM's Silver Jubilee celebration and Independence month, the Publications Branch organized many activities for customers in August. During the month-long celebration, the Publications Branch gave away 8739 copies of free books totalling RM108 452. Free postcards and cookies were also given to customers. Besides free gifts, customers were entitled to take part in quizzes about the bookstore and the books sold there. Attractive prizes were given to winners.

The Publications Branch sold books on seven occasions at seminars or events conducted outside FRIM. During the Malaysia Environment Week, FRIM echoed the government's call to go green by using only paper bags.

Publication Catalogues were produced in the months of February, April, August and October for promotional purposes. Soft copies of the catalogues were e-mailed to a total of 52 local and overseas book agents. A total of nine flyers of new publications were printed and posted to 380 local and overseas customers throughout 2010.

**RINGKASAN PENERBITAN YANG DIHASILKAN PADA TAHUN 2010**  
**SUMMARY OF PUBLICATIONS PRODUCED IN 2010**

JENIS PENERBITAN/ TYPE OF PUBLICATION	JUDUL/TITLE	BIL./ NO.
Journal of Tropical Forest Science	JTFS22(1-4)	4
FRIM in Focus	Mac, Jun, September, Disember March, June, September, December	4
Malayan Forest Records	Flora of Peninsular Malaysia Series 1: Ferns & Lycophytes, Volume 1 Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1	2
Research Pamphlet	Malaysia Plant Red List: Peninsular Malaysian Dipterocarpaceae	1
Siri Alam dan Rimba	A Guidebook to the Macrofungi of Tasik Bera	1
FRIM Reports	Kajian Perubahan Hutan Paya Laut Negeri Selangor, Kedah dan Kelantan Forest Traditional Knowledge Research and Development in Peninsular Malaysia Penanaman <i>Aquilaria</i> dan Penghasilan Gaharu di Malaysia	3
Special Publications	100 Years of Tropical Forest Research: The Story of the Forest Research Institute Malaysia Timber Features at FRIM FRIM Tapak Warisan Semula Jadi Negara Unsung Heroes of the Mud-flats	4
Conservation Malaysia	Conservation Malaysia Issue No. 11, 12	2
Proceedings	Proceedings of the Seminar on Biomass for Biofuels and Value-Added Products 2009 Proceedings of the Urban Forestry Conference 2009 "Lessons for Sustainable Development" 17-19 November 2009, Kuching, Sarawak Highlights of FRIM's Science Fund (MOSTI/MOA) Projects 2010. Project Evaluation & Monitoring Seminar, 13-14 April 2010, FRIM (CD) Highlights of FRIM's Non-Science Fund Projects 2009. Project Evaluation & Monitoring Seminar, November 2009	4
Institutional Reports	Annual Report 2009 FRIM Research Programme 2011-2015	2
Other Publications	Forestry and Economic Research Using SPSS Pests Planted Mangroves in Peninsular Malaysia <i>Gonystylus bancanus</i> : Jewel of the Peat Swamp Forest	3
<b>TOTAL</b>		<b>30</b>
Reprints	Tree Flora of Sabah and Sarawak Vol. 5 Pocket Check List of Timber Trees Movement of Seasoned Timber in Service Local Gaharu Trade and Its Contribution to Household Economy of Harvesters Penanaman <i>Aquilaria</i> dan Penghasilan Gaharu di Malaysia	5

## BUKU/BAB DI DALAM BUKU/BOOKS/CHAPTER(S) IN A BOOK

- 1 ABD. RAHMAN, K., SAM, Y.Y. & LEE, S.S. Flora. Pp. 68–95 in Shamsudin, I. et al. (Eds.) *FRIM Tapak Warisan Semula Jadi Negara*. Forest Research Institute Malaysia, Kepong.
- 2 AHMAD AZARUDDIN, M.N. & AMINAH, H. Correlation of foliar nitrogen and relative chlorophyll contents of two landscape tree species. Pp. 172–180 in Mohd Parid, M., Yap, B.W., Lim, H.F. & Norini, H. (Eds.) *Forestry and Economic Research Using SPSS*. Forest Research Institute Malaysia, Kepong.
- 3 AHMAD FAUZI, P., MOHD SHAHWAHID, O., MAD NASIR, S. & ZAKARIAH, A.R. The economic impact of sawntimber export levy trade liberalization on Peninsular Malaysia. Pp. 154–164 in Mohd Parid, M., Yap, B.W., LIM, H.F. & Norini, H. *Forestry and Economic Research Using SPSS*. Forest Research Institute Malaysia, Kepong.
- 4 AHMAD NAZARUDIN, M.R., TSAN, F.Y., ROOHAIDA, O., DING, P., NORMANIZA, O., AHMAD, S.H. & PHILIP, E. *Transactions of the Malaysian Society of Plant Physiology 18*. (Proceedings of MSPPC 2009: “Enhancing Plant Productivity and Ecosystem Services in a Challenging Environment”.) Malaysian Society of Plant Physiology. 193 pp.
- 5 AHMAD ZUHAI, Y. & HASHIM, M.N. Hutan buatan. Pp. 50–67 in Shamsudin, I. et al. (Eds.) *FRIM Tapak Warisan Semula Jadi Negara*. Forest Research Institute Malaysia, Kepong.
- 6 CHEW, M.Y. Trigonaceae. Pp. 277–281 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 7 CHUA, L.S.L. Arboretum. Pp. 131–137 in Shamsudin, I. et al. (Eds.) *FRIM Tapak Warisan Semula Jadi Negara*. Forest Research Institute Malaysia, Kepong.
- 8 CHUA, L.S.L. Species assessment and conservation in Peninsular Malaysia. Pp. 37–45 in Parris, B. S., Kiew, R., Chung, R.C.K., Saw, L.G., & Soepadmo, E. (Eds.) *Flora of Peninsular Malaysia Series I: Ferns and Lycophytes, Volume 1*. Malayan Forest Records No. 48. Forest Research Institute Malaysia, Kepong.
- 9 CHUA, L.S.L. Species assessment and conservation in Peninsular Malaysia. Pp. 47–54 in: Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 10 CHUNG, R.C.K. Erythroxylaceae. Pp. 131–136 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 11 FLETCHER, C., SAMSUDIN, M. & THESEIRA, G. REDD: The Malaysian perspective. Pp. 13–18 in Shaharuddin, M.I. et al. (Eds.) *Reducing Emissions from Deforestation and Forest Degradation: The Perspective of Malaysia*. LESTARI Occasional Publication. Universiti Kebangsaan Malaysia, Bangi.
- 12 GAN, K.S., LIM, S.C., ASMAR, H., MOHD NOR, M.Y. & ABD. RASHID, A.M. *Timber features at FRIM*. Forest Research Institute Malaysia, Kepong. 125 pp.
- 13 GAN, K.S., TAN, J.L. & ZAIRUL AMIN, R. Drying characteristics. Pp. 104–123 in Tan, Y.E., Lim, N.P.T., Gan, K.S., Wong, T.C., Lim, S.C. & Thilagawathy, M. (Eds.) *Testing Methods for Plantation Grown Tropical Timbers*. ITTO Project on Improving Utilization and Value Adding of Plantation Timber from Sustainable Sources in Malaysia. Project No. PD 306/04(1). Forest Research Institute Malaysia, Kepong.
- 14 GAN, K.S., TAN, Y.E. & LIM, S.C. (Eds.) Proceedings of the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur. 119 pp.
- 15 Herbal Monograph Committee. *Monograf Herba Malaysia Volume 2*. Kuala Lumpur. 139 pp.
- 16 JULIUS, A. Clethraceae. Pp. 101–106 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 17 JULIUS, A. Cruciferae. Pp. 107–113 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 18 KAMARUDIN, S. Torricelliaceae, Pp. 271–275 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 19 KHALI AZIZ, H. & HAMDAN, O. Flora, fauna, tanah dan sungai. Pp. 32– 43 in Shamsudin, I. et al. (Eds.) *FRIM Tapak Warisan Semula Jadi Negara*. Forest Research Institute Malaysia, Kepong.
- 20 KHALI AZIZ, H., HAMDAN, O. & MOHD AZAHARI, F. Biojisim dan kandungan karbon. Pp. 169–173 in Shamsudin, I., Ismail, P., Khali Aziz, H., Nik Zanariah, N.M., Ismail, H., Ahmad Zuhaidi, Y., Hamdan, O. & Adnan, M. (Eds.) *FRIM Tapak Warisan Semula Jadi Negara*. Forest Research Institute Malaysia, Kepong.
- 21 KHALI AZIZ, H., ISMAIL, P., ANI, S., MOHD AZAHARI, F., HARRY, Y. & IHSAN SABRI, K. *Gonystylus bancanus: Jewel of the Peat Swamp Forest*. Forest Research Institute Malaysia, Kepong. 80 pp.
- 22 KIEW, R., CHUNG, R.C.K., SAW, L.G. & SOEPADMO, E. Seed plant families in Peninsular Malaysia, Pp. 320 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 23 KIEW, R., CHUNG, R.C.K., SAW, L.G., SOEPADMO, E. & BOYCE, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong. 249 pp.
- 24 KIRTON, L.G. & NADA, B. Firefly ecotourism in Malaysia, Pp. 115 in Spalding, M., Kainuma M., Collins, L. (Eds.) *World of Atlas Mangroves*. Earthscan Ltd., London.

- 25 KOH, M.P. & SITI HANIM, S. Chemical properties. Pp. 149–155 in Tan, Y.E. et al. (Eds.) *Testing Methods for Plantation Grown Tropical Timbers*. ITTO Project on Improving Utilization and Value Adding of Plantation Timber from Sustainable Sources in Malaysia. Project No. PD 306/04(1). Forest Research Institute Malaysia, Kepong.
- 26 LAI, J.K., SALMIAH, U. & JOHN, S. Treatability. Pp. 85–91 in Tan, Y.E. et al. (Eds.) *Testing Methods for Plantation Grown Tropical Timbers*. ITTO Project on Improving Utilization and Value Adding of Plantation Timber from Sustainable Sources in Malaysia. Project No. PD 306/04(1). Forest Research Institute Malaysia, Kepong.
- 27 LAI, J.K., SALMIAH, U. & KANDAU, J. Accelerated laboratory decay test. Pp. 79–84 in Tan, Y.E. et al. (Eds.) *Testing Methods for Plantation Grown Tropical Timbers*. ITTO Project on Improving Utilization and Value Adding of Plantation Timber from Sustainable Sources in Malaysia. Project No. PD 306/04(1). Forest Research Institute Malaysia, Kepong.
- 28 LIM, C.L. Araucariaceae. Pp. 61–66 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia (FRIM), Kepong.
- 29 LIM, C.L. Tetrameristicaceae. Pp. 265–269 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia (FRIM), Kepong.
- 30 LIM, C.L., JULIUS, A., YONG, W.S.Y., KAMARUDIN, S., CHAN, Y.C., CHAN, H.T. & CHUA, L.S.L. *A Checklist of Vascular Plants for the Jengai F.R., Terengganu, Peninsular Malaysia*. 23 pp.
- 31 LIM, H.F. Some socio-economic and demographic characteristics of Orang Asli households in Air Banun Regroupment Schemes, Perak, Malaysia. Pp. 141–153 in Mohd Parid, M., Yap, B.W., Lim, H.F. & Norini, H. (Eds.) *Forestry and Economic Research Using SPSS*. Forest Research Institute Malaysia, Kepong.
- 32 LIM, N.P.T., HAMDAN, H. & PEK, Y.K. Basic veneer properties. Pp. 92–103 in Tan, Y.E., Lim, N.P.T., Gan, K.S., Wong, T.C., Lim, S.C. & Thilagawathy, M. (Eds.) *Testing Methods for Plantation Grown Tropical Timbers*. ITTO Project on Improving Utilization and Value Adding of Plantation Timber from Sustainable Sources in Malaysia. Project No. PD 306/04(1). Forest Research Institute Malaysia, Kepong.
- 33 LIM, S.C., YANG, M.C. & JAMES, J. Wood anatomical and quality studies. Pp. 11–32 in Tan, Y.E. et al. (Eds.) *Testing Methods for Plantation Grown Tropical Timbers*. ITTO Project on Improving Utilization and Value Adding of Plantation Timber from Sustainable Sources in Malaysia. Project No. PD 306/04(1). Forest Research Institute Malaysia, Kepong.
- 34 MARRYANNA, L., ABD RAHMAN, K. & MOHD GHAZALI, H. Sungai. Pp. 122–129 in Shamsudin, I. et al. (Eds.) *FRIM Tapak Warisan Semula Jadi Negara*. Forest Research Institute Malaysia, Kepong.
- 36 MOHAMAD OMAR, M. K., ALIK, D. & ZAMRIE, I. Mechanical properties. Pp. 33–44 in Tan, Y.E., Lim, N.P.T., Gan, K.S., Wong, T.C., Lim, S.C. & Thilagawathy, M. (Eds.) *Testing Methods for Plantation Grown Tropical Timbers*. ITTO Project on Improving Utilization and Value Adding of Plantation Timber from Sustainable Sources in Malaysia. Project No. PD 306/04(1). Forest Research Institute Malaysia, Kepong.
- 37 MOHD AFENDI, H., AZIAN, M. & ISMAIL, H. (Eds.) *Laporan Jawatankuasa Teknikal Mengenai Penyelidikan dan Pembangunan (R&D): Program Penanaman Pokok Bakau dan Spesies-spesies yang Sesuai di Pesisiran Pantai Negara bagi Tahun 2008*. Forest Research Institute Malaysia, Kepong. 49 pp.
- 38 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. Pp. 178–188 in Mohd. Parid, M., Yap, B.W., Lim, H.F. & Norini, H. (Eds.) *Forestry and Economic Research Using SPSS*. Forest Research Institute Malaysia, Kepong.
- 39 MOHD PARID, M., YAP, B.W., LIM, H.F. & NORINI, H. (Eds.) *Forestry and Economic Research Using SPSS*. Forest Research Institute Malaysia, Kepong. 215 pp.
- 40 NAZURA, Z., LEE S.S., CHAN, H.T. & THI, B.K. *A Guidebook to the Macromycetes of Tasik Bera*. Siri Alam dan Rimba No. 13. Forest Research Institute Malaysia, Kepong. 80 pp.
- 41 NOOR AZLIN, Y. Setting up nature education centres and interpretation programmes. Pp. 20–36 in SEAMEO-SPAFA. *Making Mangrove Eco-Museums: Workshops Papers*. Amarin Printing and Publishing Co., Ltd., Bangkok.
- 42 NOOR AZLIN, Y. & AZAHARI, M.Y. Pokok VIP. Pp. 150–163 in Shamsudin, I. et al. (Eds.) *FRIM Tapak Warisan Semula Jadi Negara*. Forest Research Institute Malaysia, Kepong.
- 43 NOOR AZLIN, Y., CHONG, M.I. & AZYATI, A.K. Nature centres for wetland conservation in Malaysia. Pp. 119–131 in SEAMEO-SPAFA. *Making Mangrove Eco-Museums: Workshops Papers*. Amarin Printing and Publishing Co., Ltd., Bangkok.
- 44 NOR EZZAWANIS, A.T. Cibotiaceae. Pp. 119–122 in Parris, B. S., Kiew, R., Chung, R.C.K., Saw, L.G., & Soepadmo, E. (Eds.) *Flora of Peninsular Malaysia Series I: Ferns and Lycophytes, Volume 1*. Malayan Forest Records No. 48. Forest Research Institute Malaysia, Kepong.
- 45 NOR EZZAWANIS, A.T. Casuarinaceae. Pp. 87–91 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 46 ONG, S.P., CHENG, S., CHONG, V.C. & TAN, Y.S. Pests of Planted Mangroves in Peninsular Malaysia. Cleartone Sdn. Bhd, Selangor. 52 pp.
- 47 PAN, K.A., FLETCHER, S.C., SHAHFIZ, M.A., NOR AZLIN, M.F., & KAVIARASU, M. Fauna. Pp. 97–111 in Shamsudin, I. et al. (Eds.) *FRIM Tapak Warisan Semula Jadi Negara*. Forest Research Institute Malaysia, Kepong.

- 48 PARRIS, B.S. & KIEW, R. History of botanical collecting and observations on ferns and lycophytes in Peninsular Malaysia. Pp. 25–36 in Parris, B. S., Kiew, R., Chung, R.C.K., Saw, L.G., & Soepadmo, E. (Eds.) *Flora of Peninsular Malaysia Series I: Ferns and Lycophytes, Volume 1*. Malayan Forest Records No. 48. Forest Research Institute Malaysia, Kepong.
- 49 PARRIS, B.S., KIEW, R., CHUNG, R.C.K., SAW, L.G. & SOEPADMO, E. (Eds.) *Flora of Peninsular Malaysia Series I: Ferns and Lycophytes, Volume 1*. Malayan Forest Records No. 48. Forest Research Institute Malaysia, Kepong. 329 pp.
- 50 RAFIDAH, A.R. Chloranthaceae. Pp. 93–100 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 51 RAFIDAH, A.R. Daphniphyllaceae. Pp. 119–125 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 52 RAFIDAH, A.R. Portulacaceae. Pp. 203–209 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 53 RAJA BARIZAN, R.S., SHAMSUDIN, I. & ISMAIL, H. (Eds.) *Unsung Heroes of the Mud-flats*. Forest Research Institute Malaysia, Kepong. 112 pp.
- 54 RASADAH, M.A., ZAINON, A.S., NIK MUSAADAH, M. & NORHARA, H. *ASEAN Herbal and Medicinal Plants*, ASEAN Secretariat, Jakarta. 336 pp.
- 55 ROHANA, A.R. & AHMAD FAUZI, P. Gap analysis on key performance indicators between best practices companies and other manufactures of wooden furniture industry in Malaysia. Pp. 189–196 in Mohd. Parid, M., Yap, B.W., Lim, H.F. & Norini, H. (Eds.) *Forestry and Economic Research Using SPSS*. Forest Research Institute Malaysia, Kepong.
- 56 RUSEA, G., YONG, W.S.Y., JOANES, U. & RIDZUAN, S. *Orchids of Perlis. Jewels of the Forest*. Perlis Forestry Department and Universiti Putra Malaysia. 152 pp.
- 57 SAW, L.G. Vegetation of Peninsular Malaysia. Pp. 21–45 in Kiew R., Chung R.C.K., Saw L.G., Soepadmo E. & Boyce P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 58 Selangor Waters Management Authority. Monitoring of the firefly habitat along Sungai Selangor. Pp. 55–58 in Kirton, L.G. & Nada, B. (Eds.) *Sungai Selangor State of River Report 2008*. Selangor Waters Management Authority, Shah Alam.
- 59 SHAMSUDIN, I. & ISMAIL, P. Pendahuluan. Pp. 13–20 in Shamsudin, I., Ismail, P., Khali Aziz, H., Nik Zanariah, N.M., Ismail, H., Ahmad Zuhaidi, Y., Hamdan, O. & Adnan, M. (Eds.) *FRIM Tapak Warisan Semula Jadi Negara*. Forest Research Institute Malaysia, Kepong.
- 60 SHAMSUDIN, I., ISMAIL, P., KHALI AZIZ, H., NIK ZANARIAH, N.M., ISMAIL, H., AHMAD ZUHAI, Y., HAMDAN, O. & ADNAN, M. (Eds.) *FRIM Tapak Warisan Semula Jadi Negara*. Forest Research Institute Malaysia, Kepong. 193 pp.
- 61 SITI MUNIRAH, M.Y. Ancistrocladaceae. Pp. 57–60 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 62 SOEPADMO, E., SAW, L.G. & CHUNG, R.C.K. (Eds.) *Tree Flora of Sabah and Sarawak Volume 5*. Reprinted. Forest Research Institute Malaysia, Sabah Forestry Department and Sarawak Forestry Department. 528 pp.
- 63 SREETHERAN, M., NOOR AZLIN, Y. & AHMAD AZARUDDIN, M.N. (Eds.) *Proceedings of the Urban Forestry Conference 2009: Lessons for Sustainable Development*. Forest Research Institute Malaysia, Kepong. 128 pp.
- 64 SYAHIDA EMIZA, S. Datisceae. Pp. 127–130 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 65 SYAMSUL, H.M., AHMAD, S., MOHD. RUSLI, Y. & AZYYATI, A.K. Demand and recreational value of Gua Kelam: An application of the travel cost method. Pp. 189–196 in Mohd Parid, M., Yap, B.W., Lim, H.F. & Norini, H. (Eds.) *Forestry and Economic Research Using SPSS*. Forest Research Institute Malaysia, Kepong.
- 66 TAN, A.L., LEE, C.P., SARAH, A.G.A., SITI MUNIRAH, M.Y. & MAT SALLEH, K. The status of Rafflesia populations in Taman Negara, Malaysia. How well are they being protected? Pp. 68–71 in Sim, H.C., Hong, L.T. & Jalonen, R. (Eds.) *Proceedings of International Symposium on Forest Genetic Resources, Conservation and Sustainable Utilization Towards Climate Change, Mitigation and Adaptation*. FRIM, APAFRI and Bioersity International, Selangor.
- 67 TAN, Y.E., LIM, S.C. & ANDREW NYORIK, N. Sampling of trees and allocation of logs. Pp. 1–10 in Tan, Y.E., Lim, N.P.T., Gan, K.S., Wong, T.C., Lim, S.C. & Thilagawathy, M. (Eds.) *Testing Methods for Plantation Grown Tropical Timbers*. ITTO Project on Improving Utilization and Value Adding of Plantation Timber from Sustainable Sources in Malaysia. Project No. PD 306/04(1). Forest Research Institute Malaysia, Kepong.
- 68 TAN, Y.E., LIM, N.P.T., GAN, K.S., WONG, T.C., LIM, S.C. & THILAGAWATHY, M. (Eds.) *Testing Methods for Plantation Grown Tropical Timbers*. ITTO Project on Improving Utilization and Value Adding of Plantation Timber from Sustainable Sources in Malaysia. Project No. PD 306/04(1). Forest Research Institute Malaysia, Kepong. 155 pp.

- 69 THESEIRA, G.W., FLETCHER, C. & NORINI, H. REDD Accounting and alternatives. Pp. 19–24 in Shaharuddin, M.I. *et al. Reducing Emissions from Deforestation and Forest Degradation: the Perspective of Malaysia*. LESTARI Occasional Publication. Universiti Kebangsaan Malaysia, Bangi.
- 70 TING, K.B. & ONG, C.B. Finger and laminate joints in non-structural timber products. Pp. 124–148 in Tan, Y.E., Lim, N.P.T., Gan, K.S., Wong, T.C., Lim, S.C. & Thilagawathy, M. (Eds.) *Testing Methods for Plantation Grown Tropical Timbers*. ITTO Project on Improving Utilization and Value Adding of Plantation Timber from Sustainable Sources in Malaysia. Project No. PD 306/04(1). Forest Research Institute Malaysia, Kepong.
- 71 UMMUL NAZRAH, A.R. & KIEW, R. Pittosporaceae. Pp. 165–170 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 72 UMMUL NAZRAH, A.R. Ctenolophonaceae. Pp. 115–118 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 73 WAN ASMA, I., MAHANIM, S.M.A., RAFIDAH, J., ZULKAFI, H. & JAILANI, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels and Value Added Products*. 27–28 October 2009, Kuala Lumpur.
- 74 WAN RASIDAH, K., SHAMSUDIN, I., AZIAN, M., JEYANNY, V., MOHAMAD FAKHRI, I., ROZITA, A, SUHAIMI, W.C. & ADI FADZLY, K. *Penanaman Bakau dan Spesies Sesuai di Pesisir Pantai Negara: Penilaian Tanah dan Pemantauan Kawasan*. Forest Research Institute Malaysia, Kepong. 39 pp.
- 75 WAN RASIDAH, K. & SUHAIMI, W.C. Tanah. Pp. 112–121 in Shamsudin, I., Ismail P., Khali Aziz, H., Nik Zanariah, N.M., Ismail, H., Ahmad Zuhaidi, Y., Hamdan, O. & Adnan, M. (Eds.) *FRIM Tapak Warisan Semula Jadi Negara*. Forest Research Institute Malaysia, Kepong.
- 76 WONG, T.C., CHAN, C.S., TING, K.B. & KHAIRUL, M. Sawing and machining. Pp. 45–78 in Tan, Y.E., Lim, N.P.T., Gan, K.S., Wong, T.C., Lim, S.C. & Thilagawathy, M. (Eds.) *Testing Methods for Plantation Grown Tropical Timbers*. ITTO Project on Improving Utilization and Value Adding of Plantation Timber from Sustainable Sources in Malaysia. Project No. PD 306/04(1). Forest Research Institute Malaysia, Kepong.
- 77 YAO, T.L. Pedaliaceae. Pp. 155–159 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.
- 78 YAO, T.L. Pentaphragaceae. Pp. 161–164 in Kiew, R., Chung, R.C.K., Saw, L.G., Soepadmo, E. & Boyce, P.C. (Eds.) *Flora of Peninsular Malaysia Series II: Seed Plants, Volume 1*. Malayan Forest Records No. 49. Forest Research Institute Malaysia, Kepong.

#### ARTIKEL JURNAL/JOURNAL ARTICLES

- 1 ABD RAHMAN, K., SAMSUDIN, M., ISMAIL, H., KHAIRUL NAJWAN, A.J., WAN SHUKRI, W.A., SHAMSUDIN, I. & WAN RAZALI, W.M. Silvicultural prescriptions for second growth forests: A case study in Tekam F.R., Pahang. *Malaysian Forester* 73(2): 155–162.
- 2 ABD RAZAK, O. & AZMY, H.M. 2009. Culms productivity of *Gigantochloa scortechinii* in response to harvesting techniques applied. *Malaysian Forester* 72(2): 219–224.
- 3 ADZMI, Y., SUHAIMI, W.C., AMIR HUSNI, M.S., MOHD. GHAZALI, H., AMIR, S.K. & BAILLIE, I. Heterogeneity of soil morphology and hydrology on the 50 ha long term ecological research plot at Pasoh, Peninsular Malaysia. *Journal of Tropical Forest Science* 22(1): 21–35.
- 4 AHMAD AZIZI, M., JALALUDDIN, H., HOSSEIN, R., RUSHDAN, I., PARIDAH, M.T., SEYED RASHID, F.H.S. & AINUN, Z.M.A. Soda-anthraquinone pulp from Malaysian cultivated kenaf for linerboard production. *BioResources* 5(3): 1542–1553.
- 5 AHMAD AZIZI, M., JALALUDDIN, H., HOSSEIN, R., RUSHDAN, I., SEYED RASHID, F.H.S. & PARIDAH, M.T. New approach to use of kenaf for paper and paperboard production. *BioResources* 5(4): 2112–2122.
- 6 AHMAD AZIZI, M., JALALUDDIN, H., PARIDAH, M.T., HOSSEIN, R., RUSHDAN, I., SEYED RASHID, F.H.S. & AINUN, Z.M.A. A review of literature related to using kenaf for pulp production (beating, fractionation, and recycled fiber). *Modern Applied Science* 4(9): 21–29.
- 7 AHMAD AZIZI, M., JALALUDDIN, H., RUSHDAN, I., HOSSEIN, R., SEYED RASHID, F.H.S., PARIDAH, M.T. & MOHD NOR, M.Y. Evaluation of linerboard properties from Malaysian cultivated kenaf soda-anthraquinone pulps versus commercial pulps. *BioResources* 5(3): 1595–1604.
- 8 AHMAD AZIZI, M., JALALUDDIN, H., SEYED RASHID, F.H.S., HOSSEIN, R., PARIDAH, M.T., RUSHDAN, I. & AINUN, Z.M.A. A review of literature related to kenaf as an alternative for pulpwoods. *Agricultural Journal* 5(3): 131–138.
- 9 AHMAD NAZARUDIN, M.R., TSAN, F.Y. & MOHD FAUZI, R. 2010. Growth inhibition of *Syzygium campanulatum* korth. for container planting by the application of uniconazole. *Pertanika Journal of Tropical Agricultural Science* 33(1): 1–6.
- 10 ALI, N.A.M., RAHMANI M., SHAARI K., ALI A. M. & EE CHENG LIAN G. Antimicrobial activity of *Cinnamomum impressicostatum* and *C. pubescens* and bioassay guided isolation of bioactive (e)-methyl Icinnamate. *Journal of Biological Sciences. Asian Network for Scientific Information*: 1–5
- 11 ALIAS, R., MOHD RUSLI, Y. & HUDA FARHANA, M.M. Technical efficiency of the Malaysian wooden furniture industry: A stochastic frontier production approach. *International Business Research Journal* 3(3): 10–15

- 12 ALIAS, S.A., ZAINUDDIN, N. & JONES, E.B.G. Biodiversity of marine fungi from mangroves in Malaysia. *Botanica Marina* 53: 545–554.
- 13 ANG, L.H., TANG, L.K., HO, W.M., HUI, T.F. & THESEIRA, G.W. Phytoremediation of Cd and Pb by four timber species grown on ex-tin tailings in Peninsular Malaysia. *World Academy of Science, Engineering and Technology* 62: 459–463.
- 14 AZMY, M., WAN RASIDAH, K., RASMINA, H. & NURMASTURA, H.A. 2009. Early performance trial of four Malaysian commercial bamboos in Southern Peninsular Malaysia. *Borneo Science* 25: 81–86.
- 15 AZURA, A., ROSHAN JAHN, M.S. & MOHD ILHAM, A. The factors affecting the extraction condition for neuroprotective activity of *Centella asiatica* evaluated by metal chelating activity. *Journal of Applied Science* 10: 837–842.
- 16 CHANG, Y.S. & LEE, S.S. Traditional knowledge about mushroom utilization by the sub-tribe Semai in Peninsular Malaysia. *Moeszia* 5(6): 84–88.
- 17 DING, P. & ONG, P.T. Extending 'Kampuchea' guava shelf-life at 27 °C using 1-methylcyclopropene. *International Food Research Journal* 17: 63–69.
- 18 FELDPAUSCH, T.R., BANIN, L., PHILLIPS, O.L., BAKER, T.R., LEWIS, S.L., QUESADA, C.A., AFFUM BAFFOE, K., ARETS, E.J.M.M., BERRY, N.J., BIRD, M., BRONDIZIO, E.S., CAMARGO, P. DE., CHAVE, J., DJAGBLETEY, G., DOMINGUES, T.F., DRESCHER, M., FEARNESIDE, P.M., FRANÇA, M.B., FYLLAS, N.M., LOPEZ GONZALEZ, G., HLADIK, A., HIGUCHI, N., HUNTER, M.O., IIDA, Y., ABU SILAM, K., ABD RAHMAN, K., KELLER, M., KEMP, J., KING, D.A., LOVETT, J.C., MARIMON, B.S., MARIMON JUNIOR, B.H., LENZA, E., MARSHALL, A.R., METCALFE, D.J., MITCHARD, E.T.A., MORAN, E.F., NELSON, B.W., NILUS, R., NOGUEIRA, E.M., PALACE, M., PATIÑO, S., PEH, K.S.H., RAVENTOS, M.T., REITSMA, J.M., SAIZ, G., SCHRODT, F., SONKÉ, B., TAEDOUNG, H.E., TAN, S., WHITE, L., WÖLL, H. & LLOYD, J. Height-diameter allometry of tropical forest trees. *Biogeosciences Discussions* 7: 7727–7793.
- 19 ISMAIL, P., ABD RAHMAN, K., NIZAM, M.S., WAN MOHD SHUKRI, W.A., SAMSUDIN, M., ISMAIL, T. & GRIPPIN, A. Impact of reduced impact logging (RIL) method on the residual stand in a peat swamp forest. *Malaysian Forester* 73(1): 23–32.
- 20 ISMAIL, P., ABD RAHMAN, K., NIZAM, M.S., WAN MOHD SHUKRI, W.A., SAMSUDIN, M., ISMAIL, T. & GRIPPIN, A. Impact of RIL system on the residual trees in peat swamp forest of Pekan Forest Reserve. *Malaysian Forester* 7(2): 149–160.
- 21 ISMAIL, H., NUR HAJAR, Z.S., WAN MOHD. SHUKRI, W.A., SAMSUDIN, M. & HARFENDY, O. Second growth forests: Are they growing and have they recovered? *Malaysian Forester* 73(2): 171–185.
- 22 IZRAN, K., KHAIRUL, M., KOH, M.P., TAN, Y.E., SAIMIN, B., NORDIN, P., ROSLY, M.J. & NAZIFFUAD, N. Physical and mechanical assessments of fire retardant-treated *Shorea macrophylla* and *Acacia mangium* particleboards. *Modern Applied Science Journal* 4(7): 3–8.
- 23 IZRAN, K., KOH, M.P., TAN, Y.E., REN, X.J., ZAIDON, A., ABOOD, F., GUENTER, B. & KHAIRUL, M. Buffering capacity of fast growing species and curing timer of resin modified with zinc borate and monoammonium phosphate. *American Journal of Applied Science* 7(8): 1079–1082.
- 24 IZRAN, K., ZAIDON, A., BEYER, G., ABDUL RASHID, A.M. & RAHIM, S. Optimising treatment system for kenaf (*Hibiscus cannabinus*) particleboard with fire retardants. *Journal of Tropical Forest Science* 22(2): 175–183.
- 25 JAAFAR, H.Z.E., IBRAHIM, M.H. & PHILIP, E. Leaf gas exchange properties of three varieties of *Labisia pumila* Benth. under greenhouse conditions. *Journal of Tropical Plant Physiology* 3: 16–25.
- 26 JAITRONG, W. & NURZATI, A.M. A new species of the ant genus *Aenictus* (Hymenoptera: Formicidae: Aenictinae) from Malay Peninsula. *Sociobiology* 56(2): 449–454.
- 27 JALALUDIN, Z., HILL, C.A.S., CURLING, D.F., XIE, Y., HASHIM, W.S. & HAMDAN, H. Analysis of the water vapour sorption isotherms of thermally modified wood. *Wood Material Science and Engineering* 5(3&4): 194–203.
- 28 JALALUDIN, Z., HILL, C.A.S., HASHIM, W.S., HAMDAN, H. & XIE, Y. Analysis of water vapour sorption of oleo-thermal modified wood of *Acacia mangium* and *Enderspermum malaccense* sp. by a parallel exponential kinetics model and according to the Hailwood-Horrobin model. *Holzforschung* 64: 763–770.
- 29 JULIUS, A., TAKANO, A., MONICA, S. & WELLY, F.T. Zingiberaceae of Maliau Basin, Sabah, Malaysia. *Journal of Tropical Biology and Conservation* 6: 1–20.
- 30 JUTTA, M., CHEW, K.L. & SAW, L.G. A new species of *Cycas* (Cycadaceae) from Peninsular Malaysia. *Blumea* 55: 249–252.
- 31 KAORU, N., TAKUYA, K., YOJIRO, M., YAMASHITA, T., MATSUO, N., YASHIRO, Y., AZIZI, R., ABD. RAHMAN, K. & NUR SUPARDI, M.N. Estimation of root biomass based on excavation of individual root systems in a primary dipterocarp forest in Pasoh Forest Reserve, Peninsular Malaysia. *Journal of Tropical Ecology* 26: 27–28.
- 32 KHAIRUL, M., IZRAN, K., MOHD. NOOR, M., MOHAMAD OMAR, M.K., MOHD JAMIL, A.W., ABDUL HAMID, S. & MOHD. HAFIZ, M. Solid wood and veneer study of 12 years old sesenduk clone. *Modern Applied Science* 4(7): 144–147.
- 33 KHAIRUL, N., SAMSUDIN, M., SAFIAH, M.Y., RODZIAH, H., AZHAN, S.I., HARRY, Y., ABD RAHMAN, K. & WAN JULIANA, W.A. Classification of second growth forests at Tekam Forest Reserve, Pahang and Cherul Forest Reserve, Terengganu. *The Malaysian Forester* 73(2): 187–195.
- 34 KHAIRUNNUUR, F.A., ZULKHAIRI, A., HAIRUSZAH, I., AZRINA, I., NURSAKINAH, I., FAZALI, F., KAMAL, M.N.H., ZAMREE, M.S. & KAMILAH, K.A.K. Hypolipemic and weight reducing properties from *Tamarindus indica* L. pulp extract in diet-induced obese rats. *International Journal of pharmacology* 6(3): 216–223.

- 35 KIEW, R. Two new species of *Paraboea* (Gesneriaceae) from Peninsular Malaysia and Thailand. *Edinburgh Journal of Botany* 67(2): 209–217.
- 36 KOSUGI, A., TANAKA, R., MAGARA, K., MURATA, Y., ARAI, T., OTHMAN, S., HASHIM, R., HAMID, Z.A.A., YAHYA, M.K.A., MOHD NOR, M.Y., WAN ASMA, I. & MORI, Y. Ethanol and lactic acid production using sap squeezed from oil palm trunks felled for replanting. *Journal of Bioscience and Bioengineering* 3: 322–325.
- 37 KULIP, J., LAM, N.F., NURHUDA, M., JULIUS, A., IDRIS, M.S., JOHNNY, G., JULIANAH, A.J. & WELLY, F.T. Medicinal plants in Maliau Basin, Sabah, Malaysia. *Journal of Tropical Biology and Conservation* 6: 21–33.
- 38 LEE, S.S., THI, B.K. & PATAHAYAH, M. An ectomycorrhizal theleporoid fungus of Malaysian dipterocarp seedlings. *Journal of Tropical Forest Science* 22(4): 355–363.
- 39 LOH, Y.F., PARIDAH, M.T., HOONG, Y.B., BAKAR, E.S., HAMDAN, H. & ANIS, M. Properties enhancement of oil palm plywood through veneer pretreatment with low molecular weight phenol-formaldehyde resin. *Journal of Adhesion Science and Technology* 24: 1729–1738.
- 40 MASUDA, S., TANI, N., OHTANI, M., LEE, S.L., NORWATI, M. & TSUMURA, Y. Isolation and characterization of 12 microsatellite loci for the tropical tree species *Shorea maxwelliana* and *S. laevis* (Dipterocarpaceae). *Conservation Genetics Resources* 2: 109–111.
- 41 MOHD PARID, M., MOHD RUSLI, Y., LIM, H.F. & ALIAS, R. Costs and benefits analysis of *Aquilaria* species on plantation for agarwood. *International Journal of Business and Social Science* 1(2): 162–174.
- 42 NASIR, N., ZAHID, M.S., MOHMADISA, H. & MOHD NASIR, H. Coastal zone mangrove distribution: a case study in Pangkor Island, Malaysia. *World Applied Sciences Journal* 9(3): 308–313.
- 43 NAZURA, Z., SITI AISYAH, A., LEE, C.W., RAINER, A., NOOR AIMI, O., MAT ROPI, M. & KHALIJAH, A. Screening of marine fungi from Malaysia for antimicrobial activity and chemical characterization of *Fasciatispora nypa*. *Botanica Marina* 53: 507–513.
- 44 NOORUL ADAWYAH, M., TANG, S.W., MOHD ASPOLLAH, S., MAWARDI, R., NORDIN, L., AHMAD BUSTAMAN, A., ABDUL MANAF, A. & NOR AZAH, M.A. Antileukemic activity of *Alpinia conchigera* and *Alpinia mutica*. *Malaysian Journal of Pharmaceutical Sciences Supplement* (1): 50.
- 45 NOR AZAH, M.A., ABD MAJID, J., MAILINA, J., SAIDATUL HUSNI, S., CHANG, Y.S., NIK YASMIN, N.Y. & MOHD FARIDZ, Z. Analysis of gaharu oils from artificially induced *Aquilaria* species. *Malaysian Journal of Pharmaceutical Sciences Supplement* (1): 73.
- 46 NOR AZAH, M.A., RAHMANI, M., KHOZIRAH, S., ISMAIL, H.B.M., SUKARI, M.A. & EE, G.C.L. Chemical constituents and antioxidant activity of *Cinamomum microphyllum*. *Pertanika Journal of Science and Technology*. 18(2): 263–270.
- 47 NOR EZZAWANIS, A.T. New combinations in Malaysian Staphyleaceae. *Gardens' Bulletin Singapore* 62(1): 127–133.
- 48 NORAZWANA, S., LING, S. K., RASADAH, M.A., ZAINON, A.S., TEO, S. H. & LEE, H.B. Screening for phyto-cytotoxic and cytotoxic compounds from Malaysian plants. *Malaysian Journal of Pharmaceutical Sciences Supplement* (1): 114.
- 49 NUR HAJAR, Z.S., WAN MOHD SHUKRI, W.A., SAMSUDIN, M., WAN RAZALI, W.M. & ISMAIL, H. Development of local volume table for second growth forests using standing tree measurements. *Malaysian Forester* 73(2): 163–170.
- 50 NURHANAN, M.Y., BEALE, P., YU, J.Q., STRAIN, D.S. & HUQ, F. Studies on combinations of platinum with paclitaxel and colchicine in ovarian cancer cell lines. *Journal of Anticancer Research* 30 (10): 4025–4037.
- 51 ONG, P.T. & O'BYRNE, P. 2010. Clarification of the status of *Thrixspermum raciborskii* in Peninsular Malaysia. *Malesian Orchid Journal* 5: 139–144.
- 52 ONG, P.T., PHOON, S.N. & JUTTA, M. New records of Orchidaceae for the Flora of Peninsular Malaysia, 2. *Acanthephippium gougahense*, *Schoenorchis jincifolia*, *Thrixspermum anceps* and *T. latisaccatum*. *Malesian Orchid Journal* 5: 17–28.
- 53 PARIDAH, M.T., SAIFULAZRY, S.O.A., JALALUDIN, H., ZAIDON, A. & RAHIM, S. Mechanical and physical properties of particleboard made from 4-year-old rubberwood of RRIM 2000 series clones. *Journal of Tropical Forest Science* 22(4): 440–447.
- 54 PHILIP, E., JAAFAR, H.Z.E. & RIZAL, M.K. The growth of *Phyllagathis rotundifolia* under different light conditions. *Journal of Tropical Plant Physiology* 2: 1–5.
- 55 PIN, K.Y., CHUAH, L., ABDULL RASHIH, A., MAZURA, M.P., FADZUREENA, J., VIMALA, S. & RASADAH, M. A. Antioxidant and anti-inflammatory activities of extracts of betel leaves (*Piper betle* L.) from solvents with different polarity. *Journal of Tropical Forest Sciences* 22(4): 448–455.
- 56 RAFEADAH, R., KADHIRAN, S., ROWAN, S., WEDER, C. & EICHHORN, S. Stress transfer in anisotropic and environmentally adaptive cellulose whisker nanocomposites. *Biomacromolecules* 11(3): 762–768.
- 57 RAFIDAH, A.R., CHEW, M.Y., UMMUL NAZRAH, A.R. & KAMARUDIN, S. The flora of Tasik Bera, Pahang, Malaysia. *Malayan Nature Journal* 62(3): 249–306.
- 58 RAHAYU, A., LEE, S.S. & SHUKOR, N.A.A. *Uromycladium tepperianum*, the gall rust fungus from *Falcataria moluccana* in Malaysia and Indonesia. *Mycoscience* 51(2): 149–153.
- 59 ROZIELA HANIM, A., ZAIDON, A., ABOOD, F. & ANWAR, U.M.K. Adhesion and bonding of preservative-treated bamboo (*Gigantochloa scortechinii*) laminates. *Journal of Applied Science* 10(14): 1435–1441.
- 60 RSHAD UL HAQ BHAT, ABDUL KHALIL, H.P.S., KHAIRUL, A., BAKARE, I.O. & ISSAM, A.M. Effect of weathering on physical, mechanical and morphological properties of chemically modified wood materials. *Journal Materials and Design* 31: 4363–4368.

- 61 SAM, Y.Y., IBRAHIM, H. & SAW, L.G. *Scaphochlamys krauensis* and *S. pusilla* spp. nov. (Zingiberaceae) from Krau Wildlife Reserve, Pahang, Peninsular Malaysia. *Nordic Journal of Botany* 28: 673–679.
- 62 SAMSUDIN, M., KHAIRUL, N., JALIL, M. S., ABD RAHMAN, K., WAN MOHD SHUKRI, W.A., ISMAIL, H. & WAN RAZALI, W.M. Stocking and species composition of second growth forests. *Malaysian Forester* 73(2): 213–225.
- 63 SIK, H.S., CHOO, K.T., SARANI, Z., SAHRIM, A., CHIA, C.H. & MAISARAH, Y. The influence of drying temperature on the hygroscopicity of rubberwood. *Journal of Agricultural Science* 2(1): 48–58.
- 64 SIK, H.S., CHOO, K.T., SARANI, Z., SAHRIM, A., HOW, S.S., MAISARAH, Y. & CHIA, C.H. Dimensional stability of high temperature dried rubberwood solid lumber at two equilibrium moisture contents. *Drying Technology* 28(9): 1083–1090.
- 65 SITI AISYAH, A., NAZURA, Z. & GARETH JONES, E.B. Biodiversity of marine fungi from mangroves in Malaysia. *Botanica Marina* 53: 545–554.
- 66 SITI HUMEIRAH, A.G., NOR AZAH, M.A., MAILINA, J., MUHAJIR, H. & PUAD, A.M. Chemical composition of three *Xylopi* leaf essential oils from Pasoh Forest Reserve, Negeri Sembilan, Malaysia. *Journal of Tropical Forest Science* 22(1): 1–4.
- 67 SITI HUMEIRAH, A.G., NOR AZAH, M.A., MASTURA, M., MAILINA, J., SAIFUL, A.J., MUHAJIR, H. & PUAD, A.M. Chemical constituents and antimicrobial activity of *Goniothalamus macrophyllus* (Anonaceae) from Pasoh Forest Reserve, Malaysia. *African Journal of Biotechnology* 9(34): 5511–5515.
- 68 SITI MUNIRAH, M.Y. & CHEW, M.Y. Cabombaceae, a new family record for Peninsular Malaysia. *Malayan Nature Journal* 62(3): 241–248.
- 69 SITI SUHAILA, A.R. & SALEH, N.M. Inhibitory effect of kanamycin on *in vitro* culture of *Lycopersicon esculentum*, Mill cv. MT11. *Journal of Agrobiotechnology and Food Sciences* 1: 67–74.
- 70 SOLIHANI, S.N., NORAINI, T., RUZI, A.R. & CHUNG, R.C.K. 2010. Nilai taksonomi ciri anatomi daun *Coelostegia Benth.* dan *Ceiba pentandra* Gaertn. (Bombacaceae). *Sains Malaysiana* 39(3): 371–376.
- 71 SREETHERAN, M. The perception of social safety in green environment: a preliminary study at Kepong Metropolitan Park. *Asian Journal of Environmental Behaviour Studies* 1(1): 103–119.
- 72 SREETHERAN, M. Establishing performance indicators from the user perspective as tools to evaluate the safety aspects of urban parks in Kuala Lumpur. *Pertanika Journal of Social Sciences and Humanities* 18(2): 199–208.
- 73 SREETHERAN, M. & AMAT RAMSA, Y. The identification of criteria and indicators to evaluate hazardous street trees of Kuala Lumpur: a Delphi study. *Journal of Forestry* 108(7): 360–364.
- 74 TAN, H.P., LING, S.K. & CHUAH, C.H. Multi-step infrared macro-fingerprinting on leaves of *Phyllagathis praetermissa* from different localities in Peninsular Malaysia. *Vibrational Spectroscopy* 52: 48–53.
- 75 TNAH, L.H., LEE, S.L., NG, K.K.S. FARIDAH, Q.Z. & FARIDAH, H.I. Highly variable STR markers of *Neobalanocarpus heimii* (Dipterocarpaceae) for forensic DNA-profiling. *Journal of Tropical Forest Science* 22: 214–226.
- 76 TNAH, L.H., LEE, S.L., NG, K.K.S., FARIDAH, Q.Z. & FARIDAH, H.I. Forensic DNA profiling of tropical timber species in Peninsular Malaysia. *Forest Ecology and Management* 259: 1436–1446.
- 77 XIE, Y., HILL, C.A.S., XIAO, Z., ZAIHAN, J., MILITZ, H. & CARSTEN, M. Water vapor sorption kinetics of wood modified with glutaraldehyde sorption kinetics. *Journal of Applied Polymer Science* 117: 1674–1682.
- 78 XIE, Y., HILL, C.A.S., ZAIHAN, J., CURLING, S.F., ANANDJIWALA, R.D., NORTON, A.J. & NEWMAN, G. The dynamic water sorption behaviour of natural fibres and kinetic analysis using the parallel exponential kinetics model. *Journal of Material Science* 46: 479–489.
- 79 YAGIHASHI, T., OTANI, T., TANI, N., NAKAYA, T., ABD RAHMAN, K., MATSUI, T. & TANOUCHI, H. Habitats suitable for the establishment of *Shorea curtisii* seedlings in a hill forest in Peninsular Malaysia. *Journal of Tropical Ecology* 26: 551–554.
- 80 YAMADA, H., TANAKA, R., SULAIMAN, O., HASHIM, R., HAMID, Z.A.A., YAHYA, M.K.A., KOSUGI, A., ARAI, T., MURATA, Y., NIRASAWA, S., YAMAMOTO, K., OHARA, S., MOHD NOR, M.Y., IBRAHIM, W.A. & MORI, Y. Old oil palm trunk: a promising source of sugars for bioethanol. *Journal of Biomass and Bioenergy* 34: 1608–1613.
- 81 ZAIHAN, J., HILL, C.A.S., CURLING, D.F., HASHIM, W.S. & HAMDAN, H. 2009. Moisture adsorption isotherms of *Acacia mangium* and sesenduk using dynamic vapour sorption. *Journal of Tropical Forest Science* 21(3): 277–285.
- 82 ZAIHAN, J., HILL, C.A.S., CURLING, S., HASHIM, W.S. & HAMDAN, H. The kinetics of water vapor sorptions: analysis using parallel exponential kinetics model on six Malaysian hardwoods. *Journal of Tropical Forest Science* 22(2): 107–117.
- 83 ZAIHAN, J., HILL, C.A.S., CURLING, D.F., XIE, Y., HASHIM, W.S. & HAMDAN, H. Analysis of the water vapour sorption isotherms of thermally modified wood. *Wood Material Science and Engineering* 5(3&4): 194–203.
- 84 ZAIHAN, J., HILL, C.A.S., HASHIM, W.S., HAMDAN, H. & XIE, Y. Analysis of water vapour sorption of oleo-thermal modified wood of *Acacia mangium* and *Enderspermum malaccense* sp. by a parallel exponential kinetics model and according to the Hailwood-Horrobin model. *Holzforschung* 64: 763–770.
- 85 ZAINUDDIN, N., LEE, S.S., CHAN, H.T., THI, B.K. & ALIAS, S.A. Macrofungi of Pulau Redang, Terengganu and Pulau Aur, Johor in the South China Sea. *Journal of Science and Technology in the Tropics* 6: 120–125.
- 86 ZULKHAIRI, H.A., KHAIRUNNUUR, A.F., HAFIPAH, M.R.N., AAZRINA, A., RASADAH, M.A., KAMILAH, K.A.K., ZAMREE, M.S. & SHAHIDAN, M.A. An aqueous extract of *Citrus mitis* possesses antioxidative properties and improves plasma lipid profiles in rat induced with high cholesterol diet. *Journal of Medicinal Plants Research* 4(1): 49–57.

**BUKU PANDUAN/RESEARCH PAMPHLET/FRIM TECHNICAL INFORMATION/TIMBER TECHNOLOGY BULLETIN  
HANDBOOK/RESEARCH PAMPHLET/FRIM TECHNICAL INFORMATION/TIMBER TECHNOLOGY BULLETIN**

- 1 CHUA, L.S.L, SUHAIDA, M., HAMIDAH, M. & SAW, L.G. *Malaysia Plant Red List: Peninsular Malaysian Dipterocarpaceae*. FRIM Research Pamphlet No. 129. Forest Research Institute Malaysia, Kepong.
- 2 HAMDAN, O., KHALI AZIZ, H. & SHAMSUDIN, I. *Kajian Perubahan Hutan Paya Laut Negeri Selangor, Kedah dan Kelantan*. FRIM Reports No. 91. Forest Research Institute Malaysia, Kepong. 24 pp.
- 3 LIM, H.F., ABDUL RASHID, A.M., LEE, S.S. AHMAD FAUZI, P., CHANG, Y.S., AHMAD ZUHAI, Y., MOHD PARID, M., LOK, E.H., MOHD FARID, A. & NOR AZAH, M.A. *Penanaman Aquilaria dan penghasilan gaharu di Malaysia*. FRIM Reports No. 93. Forest Research Institute Malaysia, Kepong. 37 pp.
- 4 LIM, H.F., NORINI, H., NORSHAKILA, Y. & INTAN NURULHANI, B. *Forest Traditional Knowledge Research and Development In Peninsular Malaysia*. FRIM Reports No. 92. Forest Research Institute Malaysia, Kepong.

**PROSIDING/TRANSAKSI  
PROCEEDINGS/TRANSACTIONS**

- 1 ABD RAZAK, O. & HASHIM, M.N. Research and development issues for sustainable bamboo resource management in Peninsular Malaysia. Pp. 21–28 in Nur Supardi, M.N., Abd Razak, O., Wan Tarmeze, W.A. & Aminah, H. (Eds.) *Proceedings of Rattan & Bamboo Seminar 2008*, 25–26 March 2008, Kuala Lumpur.
- 2 AHMAD AZARUDDIN, M.N. & MOHD FAUZI, R. Correlating morphological and physiological characters of *Hopea odorata* planted in urban areas. Pp. 30–33 in Ahmad Nazarudin, M.R., et al. (Eds.) *Proceedings of MSPPC 2009: Enhancing Plant Productivity and Ecosystem Services in a Challenging Environment. Transactions of the Malaysian Society of Plant Physiology 18*.
- 3 AHMAD NAZARUDIN, M.R., MOHD. FAUZI, R. & TSAN, F.Y. Scanning electron microscope of *Syzygium campanulatum* leaf and stem treated with uniconazole. Pp. 125–128 in Ahmad Nazarudin, M.R., et al. (Eds.). *Proceedings of MSPPC 2009: Enhancing Plant Productivity and Ecosystem Services in a Challenging Environment. Transactions of the Malaysian Society of Plant Physiology 18*.
- 4 AHMAD ZUHAI, Y., AMIR SAAIFFUDIN, K. & HASHIM, M.N. Teak (*Tectona grandis*) plantations as the alternative source of future quality round log production in Peninsular Malaysia. Pp. 49–60 in Jayaraman, K., Balasundaran, M., Bhat, K.V. & Krishnankutty, C.N. (Eds.) *Proceedings of the International Workshop on Production and Marketing of Teakwood: Future Scenarios*, 23–25 November 2009, Peechi.
- 5 ANG, L.H., HO, W.M. & RAMLI, M. Ecotoxicity and utilization on ex-tin mines in Peninsular Malaysia. Pp. 119–130 in Kanakaraju, D. et al. (Eds.) *Proceedings of Conference on Natural Resources in the Tropics 3*, 3–5 August 2009, Kuching.
- 6 ANI, S., TUMIRAH, K., SALMIAH, U. & SALAMAH, S. Stem and root anatomy of tuba—rotenone yielding climbing plant. Pp. 14–18 in *Proceedings of the Nineteenth Scientific Conference of Electron Microscopy Society of Malaysia*, 14–16 December 2010, Langkawi.
- 7 ANWAR, U.M.K., HAMDAN, H., PARIDAH, M.T., RAHIM, S., MOHD TAMIZI, M. & SITI RAFIDAH, M. Bamboo as green material—saves the forest. Pp. 60–61 in Sim, H.C. et al. (Eds.) *Asia and the Pacific Forest Products Workshop—Green Technology for Climate Change Mitigation and Adaptation*, 14–16 December 2009, Colombo.
- 8 AZIAN, M., MARRYANNA, L., WAN RASIDAH, K., JEYANNY, V. & MOHD FAKHRI, I. Status kualiti air di kawasan penanaman bakau di Tanjung Piai, Johor. Pp. 121–126 in Abd Rahman, A.R., Jefri, A.R., Jinis, A., Suhaili, H.R., Norzalyta, M.G., Nora Azlina, M., Nabilah Hamidah, S., Khairunnisa, M.M. & Ain Nur Nadillah, D. (Eds.) *Prosiding Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2009: Memulihara Pesisiran Pantai Bersama Masyarakat*, 1–2 December 2009, Kuching.
- 9 AZMALISA, T., WAN ASMA, I., ZULKAFI, H. & NORAZWINA, Z. Optimization of glucose production from oil palm trunk via enzymatic hydrolysis. Pp. 609–612 in *Proceedings of the Second International Conference on Nuclear and Renewable Energy Resources (NURER)*, 4–7 July 2010, Ankara.
- 10 FADHILAH, Z., ROSDI, K., SHARIFAH, M., NOR HASNIDA, H. & HALIZA, I. Propagation of the biodiesel-producing plant, *Jatropha curcas* L. utilizing tissue culture technology. Pp. 228–229 in Tan S.L. et al. (Eds.) *Proceedings of the National Conference on New Crops and Bioresources 2009*, 15–17 December 2009, Seremban.
- 11 GETHA, K., HEMA, T.G., MASTURA, M., TAN, A.G.Y., NUR FAIRUZ, M.Y. & LILI SAHIRA, H. Heavy metal tolerance in indigenous actinobacteria isolated from Bidor tin tailings and Pasoh forest soil. In Nik Zanariah, N.M., Ida Suraini, A.S. & Nur Supardi, M.N. (Eds.) *Highlights of FRIM's ScienceFund (MOSTI/MOA) Projects 2010*, 13–14 April 2010, Forest Research Institute Malaysia, Kepong. (In CD).
- 12 HAMDAN, H., ANWAR, U.M.K., ANA AZARENA, R. & KHAIRUL, A. Some properties of chemically modified sesenduk using propionic anhydride. In Nik Zanariah, N.M., Ida Suraini, S.A. & Nur Supardi, M.N. (Eds.) *Highlights of FRIM's ScienceFund (MOSTI/MOA) Projects 2010*, 13–14 April 2010, Forest Research Institute Malaysia, Kepong. (In CD).
- 13 HAMDAN, O., MOHD AZAHARI, F. & KHALI AZIZ, H. Alos palar satellite image for tropical forest carbon stock mapping. Pp.551–560 in Norshariza, M.B. & Asmidar, A. (Eds.) *Proceedings of the Science Technology and Social Science (STSS)*, 1–2 June 2010, Kuantan.

- 14 HASHIM, M.N., AHMAD ZUHAI, Y. & ROSDI, K. Temporal planting of vacant inter-row space with suitable forestry crops during intermediate stage of rubber plantations. Pp. 54–71 in Abd Rahman. A.R., Naaman, J., Mohd Nasaruddin, M.A., Ahmad Zuhaidi, Y., Borhanudin, A., Hamdan, N. & Sanja, B. K. (Eds.) *“Prosiding Seminar Perladangan Hutan Getah Kebangsaan 2008: Sumber Penting Bekalan Kayu-Kayan Masa Hadapan”*. 13–14 November 2008, Kuala Lumpur.
- 15 HASHIM, M.N., ROSDI K., AHMAD ZUHAI, Y. & ABDUL RAZAK O. Short rotation intensive tree plantations for the future energy generation in Malaysia. Pp. 182–191 in Wan Asma, I. Mahamin, S. Rafidah, J. Zulkafli, H. & Jailani, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels and Value-Added Products 2009*, 27–28 October 2009, Kuala Lumpur.
- 16 HUDA FARHANA, M.M., LIM, H.F., INTAN NURULHANI, B., NORSHAKILA, Y. & TARIQ MUBARAK, H. Profil sosioekonomi penduduk tempatan berkaitan dengan penanaman semula spesies rhu di Pekan, Pahang. Pp. 139–145 in Abd. Rahman, A.R. et al. (Eds.) *Proceedings of the “Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2009: Memulihara Pesisiran Pantai Bersama Masyarakat”*, 1–2 December 2009, Kuching.
- 17 ISMAIL, P. & SALIM, A. Forest inventory towards sustainable forest management (SFM) in Malaysia. Pp. 145–152 in Renu, S. & Rawat, R.S. (Eds.) *Proceedings of National Forest Inventory: the Experiences of Non-Annex I Countries*, 27–29 April 2009, Dehradun.
- 18 JEYANNY, V., AHMAD ZUHAI, Y., SUHAIMI, W.C. & AMIR, S.K. Site suitability assessment for sustainable forest plantation establishment of *Dyera costulata* in a West Malaysian tropical forest. Pp. 1–4 in Gilkes, R.J. & Prakongkep, N. (Eds.) *Proceedings of the Nineteenth World Congress on Soil Science: Solutions for a Changing World*, 1–6 August 2010, Brisbane.
- 19 KHAIRUL, M., ABDUL HAMID, S., MOHD JAMIL, A.W., KHAIRUL, A., IZRAN, K., YANTI, A.K., NASASARUDIN, M.I., SABRI, Y. & KHADIJAH, K. Physical and mechanical properties of solid cocolumber and its uses. Pp. 59–62 in Sivapragasam et al.(Eds.) *Proceedings of the National Coconut Conference (NCC) 2009–Opportunities for a Sunrise Industry*, 28–30 July 2009, Damai Laut, Perak.
- 20 KHALI AZIZ, H., HAMDAN, O., MOHD. AZAHARI, F. & MOHD NASIR, H. *Nypa fruticans* as an alternative bio-fuel energy source: a case study on its population mapping using satellite imagery. Pp. 10–19 in Wan Asma, I. Mahamin, S. Rafidah, J., Zulkafli, H. & Jailani, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels and Value-Added Products 2009*, 27–28 October 2009, Kuala Lumpur.
- 21 KOH, M.P. & RAHIM, S. Issues of formaldehyde emission from wood composite products of Malaysia. Pp. 17–19 in Sim, H.C. et al. (Eds.) *Asia and the Pacific Forest Products Workshop-Green Technology for Climate Change Mitigation and Adaptation*, IUFRO World Series 27, 14–16 December 2009, Colombo.
- 22 KOH, M.P., RAHIM, S. THESEIRA, G., MOHD JANI, S. & LAWRENCE, L. High density fibreboard from oil palm empty fruit bunches in reducing green house gases production. Pp. 105–111 in Wan Asma, I., Mahanim, S.M.A., Rafidah, J., Zulkafli, H. & Jailani, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels and Value-Added Products*, 27–28 October 2009, Kuala Lumpur.
- 23 LATIFAH, J., MAHMUDIN, S., RUSHDAN, I. & MOHD NOR, M.Y. Kenaf paper: From laboratory to pilot plant production. Pp. 98–104 in Wan Asma, I., Mahanim, S.M.A., Rafidah, J., Zulkafli, H. & Jailani, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels and Value-Added Products*, 27–28 October 2009, Kuala Lumpur.
- 24 LATIFAH, J., RUSHDAN, I., MASTURA, M. & MAHMUDIN, S. Cellulose modification for potential hygiene paper application. In Nik Zanariah, N.M., Ida Suraini, A.S. & Nur Supardi, M.N. (Eds.) *Highlights of FRIM's ScienceFund (MOSTI/MOA) Projects 2010*, 13–14 April 2010, Forest Research Institute Malaysia, Kepong. (In CD).
- 25 LEE, S.L., NG, K.K.S., TNAH, L.H. & HONG, L.T. Optimum population sizes for effective conservation and management of tropical plant species. Pp. 51–53 in Sim, H.C., Hong, L.T. & Jalonen, R. (Eds.) *International Symposium on Forest Genetic Resources: Conservation and Sustainable Utilization Towards Climate Change Mitigation and Adaptation*, 5–8 October 2009, Kuala Lumpur.
- 26 LILI SAHIRA, H., GETHA, K., MOHD ILHAM, A., SITI SYARIFAH, M.M., NORHAYATI, I., HEMA, T.G., NUR FAIRUZ, M.Y., ANEE SURYANI, S. & ROSHAN JAHN, M.S. Development of potential anti-parasitic drug candidate: Study of soil actinobacteria for activity against neglected diseases caused by *Trypanosoma brucei brucei* strain BS221. In Nik Zanariah, N.M., Nur Supardi, M.N. & Roshamida, R. (Eds.) *Highlights of FRIM's Non-Science Fund Project 2009: Project Evaluation and Monitoring Seminar (PEM)*, 8 November 2009, Genting Highlands. (In CD).
- 27 LIM, H.F., INTAN NURULHANI, B., MOHD NASIR, H., TARIQ MUBARAK, H., HUDA FARHANA, M.M., MOHD. PARID, M. Local people response to mangrove/rhu replanting in Malaysia. Pp. 55–58 in Teng, T.T., Yusri, Y. & Fera Fizani, A.F. (Eds.). *Second International Conference on Environmental Research and Technology*, 2–4 June 2010, Penang.
- 28 LIM, H.F., INTAN NURULHANI, B., MOHD NASIR, H., TARIQ MUBARAK, H., HUDA FARHANA, M.M., MOHD PARID, M. & NORSHAKILA, Y. Maklum balas masyarakat tempatan terhadap penanaman bakau dan rhu oleh kerajaan Malaysia. Pp. 103–114 in Abd. Rahman, A.R. et al. (Eds.) *Proceedings of the “Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2009: Memulihara Pesisiran Pantai Bersama Masyarakat”*, 1–2 December 2009, Kuching.
- 29 LIM, H.F., NORINI, H., NORSHAKILA, Y., INTAN NURULHANI, B., ZAINON, A.S. & NIK MUSAADAH, M. Looking for the potential economic value of traditional medicinal plants: experience in working with the Orang Asli in Malaysia. Pp. 156–167 in Chin, Y.M., Faridah, H.I., Poh, L.Y., Tuan Marina, T.I. (Eds.) *“Prosiding Persidangan Kebangsaan Penilaian Ekonomi Sumber Hutan”*, 11–13 November 2009, Kuala Lumpur.

- 30 MAHANIM, S.M.A., RAFIDAH, J., PUAD, E., WAN ASMA, I. & SHAHARUDDIN, H. The effect of activation conditions on morphological structure of bamboo activated carbon. Pp. 209–211 in Wan Asma, I., Mahanim, S.M.A., Rafidah, J., Zulkafli, H. & Jailani, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels and Value Added Products*, 27–28 October 2009, Kuala Lumpur.
- 31 MAILINA, J., NOR AZAH, M.A., MASTURA, M., MAZURA, P., SITI HUMEIRAH, A.G., ONG, B.K., VIMALA, S., SAIDATUL HUSNI, S., MOHAMAD FARIDZ, Z., NIK YASMIN, N.Y. & AAHMAD ABDUL QAYYUM, M. The potential of essential oils and/or phytoextracts from family Zingiberaceae and Annonaceae in cosmeceutical products formulation. In Nik Zanariah, N.M., Ida Suraini, A.S. & Nur Supardi, M.N. (Eds.) *Highlights of FRIM's ScienceFund (MOSTI/MOA) Projects 2010*, 13–14 April 2010, Forest Research Institute Malaysia, Kepong. (In CD).
- 32 MOHAMAD FAKHRI, I., ADI FADZLY, A.K., JEYANNY, V., WAN RASIDAH, K., SUHAIMI, W.C. & NORHISYAM, I. Kadar hakisan tanah kawasan hutan paya bakau di Pantai Sungai Haji Dorani, Sungai Besar, Selangor. Pp. 117–120 in Abd. Rahman, A.R. et al.(Eds.) “*Prosiding Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2009: Memulihara Pesisiran Pantai Bersama Masyarakat*”, 1–2 December 2009, Kuching.
- 33 MOHD AFENDI, H., TARIQ MUBARAK, H., MARZALINA, M., MOHD NASIR, H. & LIM, H.F. Penanaman pokok pesisiran pantai bersama komuniti. Pp. 217–220 in Abd. Rahman, A.R. et al.(Eds.) “*Prosiding Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2009: Memulihara Pesisiran Pantai Bersama Masyarakat*”, 1–2 December 2009, Kuching.
- 34 MOHD ASWAD, R. & AHMAD NAZARUDIN, M.R. An evaluation on the importance and performance of Gunung Lang Recreational Park's facilities and activities. Pp. 110–117 in Sreetheran, M., Noor Azlin, Y. & Ahmad Azaruddin, M.N. (Eds.) *Proceedings of the Urban Forestry Conference 2009*, 17–19 November 2009, Kuching.
- 35 NADA, B., KIRTON, L.G., NORMA RASHID, Y. & KHOO, V. Conservation efforts for the synchronous fireflies of the Selangor River in Malaysia. Pp. 160–171 in Napompeth, B. (Ed.) *Diversity and Conservation of Fireflies. Proceedings of the International Symposium on Diversity and Conservation of Fireflies*, 26–30 August 2008, Chiang Mai.
- 36 NASHATUL ZAIMAH, N.A. & NOR HASNIDA, H. Encapsulation of tongkat ali somatic embryos. *Highlights of FRIM's Non ScienceFund Projects 2009: Project Evaluation and Monitoring Seminar*, 8–9 November 2009, Forest Research Institute Malaysia, Kepong. (In CD).
- 37 NG, C.H., LEE, S.L., NG, K.K.S., NORWATI, M. & LEE, C.T. Paternity analysis of *Shorea platyclados* (meranti bukit) using microsatellite markers to establish F1 mapping population for molecular breeding. Pp. 43–45 in Nik Zanariah, N.M., Ida Suraini, A.S. & Nur Supardi, M.N. (Eds.) *Highlights of FRIM's ScienceFund (MOSTI/MOA) Projects 2010*, 13–14 April 2010, Forest Research Institute Malaysia, Kepong. (In CD).
- 38 NG, F.S.P. & SAW, L.G. Biodiversity-biotechnology in the context of knowledge generation and management. Pp. 189–193 in Rita, M., Zaliha, C.A., Fasihuddin, B.A. & Kuek, C. (Eds.) *Proceedings of Biodiversity-Biotechnology: Gateway to Discoveries, Sustainable Utilization and Wealth Creation*, 19–21 November 2008, Kuching.
- 39 NG, K.K.S., LEE, S.L. & UENO, S. Out-crossing tree species are more susceptible to the negative impact of logging. Pp. 54–63 in Sim, H.C., Hong, L.T. & Jalonen, R. (Eds.) *Proceedings of the International Symposium on Forest Genetic Resources: Conservation and Sustainable Utilization towards Climate Change Mitigation and Adaptation*, 5–8 October 2009, Kuala Lumpur.
- 40 NIK ADLIN, N.M.S., SHAMSUDIN, I., WAN TARMEZE, W.A., HAMDAN, H., KHAIRUL, M. & TARIQ MUBARAK, H. Kayu bakau (*Rhizophora* spp.) sebagai bahan pembuatan produk hiasan taman dan landskap. Pp. 158–160 in Abd. Rahman, A.R. et al.(Eds.) “*Prosiding Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2009: Memulihara Pesisiran Pantai Bersama Masyarakat*”, 1–2 December 2009, Kuching.
- 41 NOR AZAH, M.A., MOHD NASIR, M.A., ABD MAJID, J., SAIDATUL HUSNI, S. & MAILINA, J. Establishment of chemical and aroma profiles from selected gaharu samples (*Aquilaria*) by chromatographic tools and sensor technology. In Nik Zanariah, N.M., Ida Suraini, A.S. & Nur Supardi, M.N. (Eds.) *Highlights of FRIM's ScienceFund (MOSTI/MOA) Projects 2010*, 13–14 April 2010, Forest Research Institute Malaysia, Kepong. (In CD).
- 42 NOR HASNIDA, H., NORWATI, M., KODISWARAN, K., FADHILAH, Z., HALIZA, I., LING, S.K., ABDULL RASHIH, A., MOHD RADZI, A., NIK MUSAADAH, M. & SITI SYARIFAH, M.M. Scaling up tongkat ali hairy root culture using bioreactor technology for the production of bioactive compounds. In Nik Zanariah, M.N., Ida Suraini, S.A. & Nur Supardi, M.N. (Eds.) *Highlights of FRIM's ScienceFund (MOSTI/MOA) Projects 2010*: 13–14 April 2010, Forest Research Institute Malaysia, Kepong. (In CD).
- 43 NORALIZA, A., NOR DATIAKMA, M.A., ANEE SURYANI, S., NASHATUL ZAIMAH, N.A., NORWATI, A. & MARZALINA, M. Proteome profiling of *Aquilaria malaccensis* upon cold stress conditions. *Highlights of FRIM's ScienceFund (MOSTI/MOA) Projects 2010*: 13–14 April 2010, Forest Research Institute Malaysia, Kepong. (In CD).
- 44 NORHAYATI, M., NOR AZAH, M.A., NORAMLY, M., ZURIATI, Z. & LAILY, D. Essential oils from the stem and leaves of *Shorea acuminata* (Dipterocarpaceae). Pp. 321–324 in Elisabeth, C.W. et al. (Eds.) *Proceedings of the International Conference on Medicinal Plants*, 21–22 July 2010, Surabaya.
- 45 NORHAYATI, M., LAILY, D., ZURIATI, Z., NORAMLY, M. & NOR AZAH, M.A. Komposisi kimia minyak pati akar, batang, kulit dan daun *Shorea acuminata* (Dipterocarpaceae). Pp. 583–586 in “*Prosiding Kolokium Siswazah ke-10*”, 23–24 Jun 2010, Universiti Kebangsaan Malaysia, Bangi. (In CD).
- 46 NORLIA, B., NOR HASNIDA, H., NORWATI, A., MOHD ROSLI, H., MOHD NOOR, I., FADZLI, A., ZAINON, A.S. & NORWATI, M. Isolation of total RNA from hairy root culture of tongkat ali (*Eurycoma longifolia*) for the next generation DNA sequencing. In Nik Zanariah, N.M., Ida Suraini, A.S. & Nur Supardi, M.N. (Eds.) *Highlights of FRIM's ScienceFund (MOSTI/MOA) Projects 2010*, 13–14 April 2010, Forest Research Institute Malaysia, Kepong. (In CD).

- 47 NORULAIMAN, Y., ONG, B.K., NOR AZAH, M.A. & MOHD IRMAN, S.M. Comparison of different plating techniques in microbial enumeration for herbal based product. In Nik Zanariah, N.M., Nur Supardi, M.N. & Roshamida, R.(Eds.) *Highlights of FRIM's Non ScienceFund Projects*, Project Evaluation and Monitoring Seminar (PEM), 8–9 November 2009, Genting Highlands, Pahang. (In CD).
- 48 NORWATI, A., NORLIA, B., MOHD ROSLI, H., NORWATI, M. & ANEE SURYANI, S. Study on Bt protein expression in transformed teak (*Tectona grandis*) clone. In Nik Zanariah, M.N., Ida Suraini, S.A. & Nur Supardi, M.N. (Eds.) *Highlights of FRIM's ScienceFund (MOSTI/MOA) Projects 2010*, 13–14 April 2010, Forest Research Institute Malaysia, Kepong. (In CD).
- 49 NUR HAFIZAH, A.G., ANWAR, U.M.K., HAMDAN, H., NURMAIZATULHANA, O., ZETTY ZULIKHA, H., SITI RAFIDAH, M. & MAHANIM, S.M.A. Impregnation of sesendok (*Endospermum* spp.) with phenolic resin: a preliminary study. Pp. 192–195 in Wan Asma, I., Mahanim, S.M.A., Rafidah, J., Zulkafli, H. & Jailani, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels and Value-Added Products*, 27–28 October 2009, Kuala Lumpur.
- 50 NUR ZATI, A.M. & IDRIS, A.B. Impact of VJR sizes on ant community. Pp. 128–130 in “*Penyelidikan Terkehadapan Sains dan Teknologi UKM-UNRI. Prosiding Seminar UKM-UNRI ke-6*”, 24–25 June 2009, Universiti Kebangsaan Malaysia, Bangi.
- 51 NUR ZATI, A.M. & IDRIS, A.B. Ants community structure in relation to the topography variation. Pp. 336–338 in “*Penyelidikan Terkehadapan Sains dan Teknologi UKM-UNRI. Prosiding Seminar UKM-UNRI ke-6*”, 24–25 June 2009, Universiti Kebangsaan Malaysia, Bangi.
- 52 NURHANIM, M.N., NORAINI, T., CHUNG, R.C.K. & RUZI, A.R. Ciri mikromorfologi epidermis daun *Colona* Cav. (*Malvaceae-Grewioideae*). Pp. 124–130 in *Proceedings of the 11th Symposium of the Malaysian Society of Applied Biology. Biological Balance Towards Life Sustainability*, 13–15 June 2010, Kota Bharu.
- 53 NURMAIZATULHANA, O., ANWAR, U.M.K., HAMDAN, H., ZETTY ZULIKHA, H., NURHAFIZAH, A.G. & MAHANIM, S.M.A. Chemical modification of *Acacia mangium*: Effect of duration on weight percent gain. Pp. 196–200 in Wan Asma, I., Mahanim, S.M.A., Rafidah, J., Zulkafli, H. & Jailani, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels and Value Added Products*, 27–28 October 2009, Kuala Lumpur.
- 54 NURUL AINI, C.A.C., NORAINI, T., CHUNG, R.C.K. & RUZI, A.R. Nilai taksonomi ciri peruratan daun bagi setiap spesies terpilih daripada genus *Grewia* dan *Microcos* (*Malvaceae-Grewioideae*). Pp. 151–156 in *Proceedings of the Eleventh Symposium of the Malaysian Society of Applied Biology. Biological Balance Towards Life Sustainability*, 13–15 June 2010, Kota Bharu.
- 55 ONG, B.K., NORHAYATI, A., SAIFUL AZMI, J., NORULAIMAN, Y., ROHANA, S., NOR AZAH, M.A., VIMALA, S., IHSAN SAFWAN, K., ILYANIE, Y., KOO, G.H. & MOHD RADZI, A. Evaluation and utilization of *Syzygium* species as natural preservative for nutraceutical and/or cosmeceutical products. In Nik Zanariah, N.M., Ida Suraini, A.S. & Nur Supardi, M.N. (Eds.) *Highlights of FRIM's ScienceFund (MOSTI/MOA) Projects 2010*, 13–14 April 2010, Forest Research Institute Malaysia, Kepong. (In CD).
- 56 PAN, K.A., SITI HAWA, Y., NOR AZLIN, M.F., SHAHFIZ, M.A. & RAHMAH, I. Hornbills and barbets of Kuala Atok, Taman Negara Pahang. Pp. 433–437 in Mohd Nawayai, Y., Shukor, M.N., Rahmah, I. and Syarifah Khadiejah, S.M.K. (Eds.) *Proceedings of the National Biodiversity Seminar 2008*. 26–28 November 2008, Department of Wildlife and National Park.
- 57 PATAHAYAH, M., LEE, S.S. & MOHD. FARID, A. Survei penyakit pokok di kawasan penanaman bakau di pesisir pantai barat Semenanjung Malaysia. Pp. 843–87 in “*Prosiding Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2009. Memulihara Hutan Pesisiran Pantai Bersama Masyarakat*”, 1–2 December 2009, Kuching.
- 58 PUAD, E., WAN ASMA, I., SHAHARUDDIN, H., RAFIDAH, J. & MAHANIM, S.M.A. Briquetting industry in Malaysia: opportunities and challenges. Pp. 93–97 in Wan Asma, I., Mahanim, S.M.A., Rafidah, J., Zulkafli, H. & Jailani, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels and Value Added Products*, 27–28 October 2009, Kuala Lumpur.
- 59 RAHIM, S. Conversion of biomass into biocomposite products. Pp. 363–46 in Wan Asma, I., Mahanim, S.M.A., Rafidah, J., Zulkafli, H. & Jailani, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels and Value Added Products*, 27–28 October 2009, Kuala Lumpur.
- 60 RAHIM, S. Wood waste utilization for wood composite industries in Malaysia. Pp. 35–37 in Sim, H.C. *et al.* (Eds.) *Asia and the Pacific Forest Products Workshop-Green Technology for Climate Change Mitigation and Adaptation*, IUFRO World Series 27, 14–16 December 2009, Colombo.
- 61 RAJA BARIZAN, R.S. & SITI NORMASLIANA, M.T. Penambahbaikan teknik penanaman inovatif BEM (Bamboo Encasement Method). Pp. 165–171 in Abd. Rahman, A.R. *et al.* (Eds.) “*Prosiding Seminar Kebangsaan Pemuliharaan Hutan Pesisir Pantai Negara 2009: Memulihara Pesisiran Pantai Bersama Masyarakat*”, 1–2 December 2009, Kuching.
- 62 ROSAZLIN, A., FAUZIAH, C.I., WAN RASIDAH, K., & ROSENANI, A.B. Effect of soil amended with raw and composted recycled paper mill sludge as nitrogen source for misai kucing (*Orthosiphon stamineus*). Pp. 187–191 in Zaharah, A.R. (Ed.) *Proceedings of the International Conference on Balanced Nutrient Management for Tropical Agriculture*, 12–16 April 2010, Kuantan.
- 63 ROSAZLIN, A., FAUZIAH, C.I., WAN RASIDAH, K. & ROSENANI, A.B. Leaching of heavy metals (Cu, Mn, Zn, Ni, Pb and As) after six months application of raw and composted recycled paper mill sludge. Pp. 162–165 in Gilkes, R.J. & Prakongkep, N. (Eds.) *Proceedings of the Nineteenth World Congress on Soil Science: Solutions for a Changing World*, 1–6 August 2010, Brisbane, Australia.

- 64 ROZITA, A., WAN RASIDAH, K. & ROSAZLIN, A. Distribution pattern of heavy metals in soil fertilized with industrial sludge. Pp. 72–75 in Gilkes, R.J. & Prakongkep, N. (Eds.) *Proceedings of the Nineteenth World Congress on Soil Science: Solutions for a Changing World*, 1–6 August 2010, Brisbane.
- 65 ROZITA, A., WAN RASIDAH, K., ROSAZLIN, A., WAN ASMA, I., MOHAMAD JANI, S., WAN HASAN, W.A., MOHAMAD IZWAN, J. & AZIZAH, A. Evaluation of various organic mulches and fertilizer application on the yield and growth of *Orthosiphon stamineus* on problematic soils. Pp. 212–219 in Wan Asma I., Mahanim, S., Rafidah, J., Zulkafli, H. & Jailani, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels & Value-Added Products 2009*, 27–28 October 2009, Kuala Lumpur.
- 66 RUSHDAN, I., LATIFAH, J. & MAHMUDIN, S. Influence of the soda-anthraquinone pulping parameters on the pulp properties of kenaf (*Hibiscus cannabinus* L.) V36 cultivar in producing rayon grade pulp. In Nik Zanariah, M.N., Ida Suraini, S.A. & Nur Supardi, M.N. (Eds.) *Highlights of FRIM's ScienceFund (MOSTI/MOA) Projects 2010*, 13–14 April 2010, Forest Research Institute Malaysia, Kepong. (In CD).
- 67 SALBIAH, M., FAUZIAH, A., & LING, S.K. Chemical fingerprints of *Orthosiphon stamineus* by using FT-IR spectroscopy with 2D-IR correlation spectroscopy. Natural Products R&D leads from nature. Pp. 237–246 in Mashitah, M.Y. (Ed.) *Proceedings of the Malaysian Natural Products International Seminar 2009*, 23–24 November 2009, Kuantan.
- 68 SALMIAH, U., BAHARUDIN, K. & ANI, S. Sapstain fungi in timber. Pp. 1–3 in Electron Microscopy Society Malaysia Secretariat (Eds.) *Proceedings of the Nineteenth Scientific Conference of Electron Microscopy Society of Malaysia*, 14–16 December 2010, Langkawi.
- 69 SHAHARUDDIN, H., RAFIDAH, J., WAN ASMA, I., PUAD, E. & MAHANIM, S.M.A. Production of biodiesel from *Jatropha curcas* oil with a high content of free fatty acid by ESTRANS Process. Pp. 230–233 in Wan Asma, I., Mahanim, S.M.A., Rafidah, J., Zulkafli, H. & Jailani, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels and Value-Added Products*, 27–28 October 2009, Kuala Lumpur.
- 70 SOLIHANI, S.N., NORAINI, T. & CHUNG, R.C.K. Morfologi trikom *Ochroma lagopus* Swartz (Bombacaceae). Pp. 140–145 in *Proceedings of the Eleventh Symposium of the Malaysian Society of Applied Biology. Biological Balance Towards Life Sustainability*, 13–15 June 2010, Kota Bharu.
- 71 TAN, A.L., SUM, S.P. & CHANG, Y.S. Some observations on the morphological characteristics of *Labisia pumila* (kacip fatimah) at Pasoh Forest Reserve, Negeri Sembilan, Malaysia. Pp. 117–120 in Manurung, R., Zaliha, C.A., Fasihuddin, B.A. & Kuek, C. (Eds.) *Biodiversity-Biotechnology Symposium 2008, Gateway to Discoveries, Sustainable Utilization and Wealth Creation*, 19–21 November 2008, Kuching.
- 72 TAN, H.S., NADIAH, I., CHUNG, R.C.K. & SOEPADMO, E. Tree species diversity and endemism in Borneo. Pp. 1–36 in Nik Zanariah, N.M., Nur Supardi, M.N. & Roshamida, R. (Eds.) *Highlights of FRIM's Non ScienceFund Projects 2009*. Project Evaluation Meeting (PEM), 8–9 November 2009. Forest Research Institute Malaysia, Kepong. (In CD).
- 73 TAN, J.P.C., SAM, Y.Y., KANDASAMY, K.I. & TASNIM, G. Micropropagation of *Globba corneri* (Zingiberaceae), an endemic ginger with ornamental potential. In Nik Zanariah, N.M., Nur Supardi, M.N. & Roshamida, R. (Eds.) *Highlights of FRIM's Non ScienceFund Projects 2009*. Project Evaluation Meeting (PEM), 8–9 November 2009. Forest Research Institute Malaysia, Kepong. (In CD).
- 74 TARIQ MUBARAK, H., LIM, H.F., INTAN NURULHANI, B., MOHD. NASIR, H., HUDA FARHANA, M.M. & MOHD. AFENDI, H. Menggerak komuniti ke arah menangani masalah pemeliharaan pesisiran pantai: kajian kes di Sabak Bernam, Selangor. Pp. 153–157 in Abd. Rahman, A.R. et al. (Eds.) *"Prosiding Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2009: Memulihara Pesisiran Pantai Bersama Masyarakat"*, 1–2 December 2009, Kuching, Sarawak.
- 75 THI, B.K. & LEE, S.S. Molecular phylogeny of *Lignosus* spp. (Tiger's milk fungus): implications for taxonomy and utilization. In Nik Zanariah, N.M., Nur Supardi, M.N. & Roshamida, R. (Eds.) *Highlights of FRIM's Non ScienceFund Projects 2009*. Project Evaluation Meeting (PEM), 8–9 November 2009. Forest Research Institute Malaysia, Kepong. (In CD).
- 76 TSUMURA, Y., KADO, T., YOSHIDA, K., ABE, H., OHTANI, M., TAGUCHI, Y., FUKUE, Y., TANI, N., UENO, S., YOSHIMURA, K., KAMIYA, K., HARADA, K., TAKEUCHI, Y., DIWAY, B., FINKELDEY, R., NA'iem, M., INDRIOKO, S., NG, K.K.S., NORWATI, M. & LEE, S.L. Molecular database for classifying *Shorea* species (Dipterocarpaceae) and searching the origin of timber in some *Shorea* species. Pp. 45–46 in Sim, H.C., Hong, L.T. & Jalonen, R. (Eds.) *International Symposium on Forest Genetic Resources: Conservation and Sustainable Utilization towards Climate Change Mitigation and Adaptation*, 5–8 October 2009, Kuala Lumpur.
- 77 VIMALA, S., ROHANA, S., JULIZA, M. & ABDULL RASHIH, A. Antioxidant evaluation on the leaf of *Persicaria coronarium* towards the production of natural antioxidant standardized extract for product development. In Nik Zanariah, N.M., Ida Suraini, A.S. & Nur Supardi, M.N. (Eds.) *Highlights of FRIM's ScienceFund (MOSTI/MOA) Projects 2010*, 13–14 April 2010, Forest Research Institute Malaysia, Kepong. (In CD).
- 78 VINCENT, J.R., ISMARIAH, A., SCHWABE, K.A., WEIDNER, E., RODZIAH, H., MARRYANNA, L., TAN-SOO, J-S. Measuring tropical forests' impacts on watershed services: spatial variation in quantity and costs. Pp. 1–28 in *Proceedings of the Theme 3.6: Valuation of Environmental Services and Benefit Sharing*. X111 World Forestry Congress, 18–23 October 2009, Buenos Aires.
- 79 WAN ASMA, I., MOHAMMAD GHADDAFFI, M.N., RAFIDAH, J. & MORI, Y. Biomass resources for second generation biofuels in Malaysia. Pp. 1–9 in Wan Asma, I., Mahanim, S.M.A., Rafidah, J., Zulkafli, H. & Jailani, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels and Value Added Products*, 27–28 October 2009, Kuala Lumpur.

- 80 WAN RASIDAH, K., MOHAMAD FAKHRI, I., SUHAIMI, W.C., JEYANNY, V., ROZITA, A. & ADI FADZLY, A.K. Soil physical changes of a coastal mudflat after wave breaker installation. Pp. 179–182 in Gilkes, R.J. & Prakongkep, N. (Eds.) *Proceedings of the Nineteenth World Congress on Soil Science: Solutions for a Changing World*, 1–6 August 2010, Brisbane.
- 81 WAN RASIDAH, K., RAJA BARIZAN, R.S., MOHAMAD FAKHRI, I., SUHAIMI, W.C., JEYANNY, V., ADI FADZLY, A.K. & ROZITA, A. Perubahan tanah dan kesannya terhadap pertumbuhan pokok bakau di dataran lumpur Sg Hj. Dorani, Selangor. Pp. 43–50 in Abd. Rahman, A.R. *et al.* (Eds.) “*Prosiding Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2009: Memulihara Pesisiran Pantai Bersama Masyarakat*”, 1–2 December 2009, Kuching.
- 82 WAN RASIDAH, K., ROSAZLIN, A. & ROZITA, A. Growth of tongkat ali (*Eurycoma longifolia*) on a sandy beach ridges soil in Malaysia. Pp. 104–107 in Gilkes R.J. & Prakongkep N. (Eds.) *Proceedings of the Nineteenth World Congress on Soil Science: Solutions for a Changing World*, 1–6 August 2010, Brisbane.
- 83 WAN TARMEZE, W.A., MARZALINA, M., KHAIRUL, A., ABDUL HAMID, S., EMLEE, M.T. & MOHD SOPIAN, M. POPS Lumber™ promoting the ‘waste to wealth’ raw materials for wood-based industries. Pp. 276–280 in Wan Asma, I., Mahanim, S.M.A., Rafidah, J., Zulkafli, H. & Jailani, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels and Value-Added Products 2009: Towards Efficient Utilization of Biomass*, 27–28 October 2009, Kuala Lumpur.
- 84 YONG, W.S.Y., CHAN, Y.M., SUHAIDA, M., HAMIDAH, M., LAU, K.H., CHUA, L.S.L., CHAN Y.C. & DAMANHURI, S. Rare and endangered plants of Peninsular Malaysia: what have we achieved so far? In Nik Zanariah, N.M., Nur Supardi, M.N. & Roshamida, R. (Eds.) *Highlights of FRIM’s Non ScienceFund Projects 2009*. Project Evaluation Meeting (PEM), 8–9 November 2009. Forest Research Institute Malaysia, Kepong. (In CD).
- 85 ZAHID, M.S., NASIR, N., MOHMADISA, H. & MOHD NASIR, H. Mangrove and coastal forest habitat distribution and species diversity in Pangkor Island. Pp. 87–98 in Jamaluddin M.J., Muhammad Rizal, R., Azahan, A., Kadaruddin, A. & Kadir, A. (Eds.) *Proceedings of the Second International Conference on Human Habitat and Environment*, 15–16 June 2010, Negeri Sembilan.
- 86 ZETTY ZULIKHA, H., ANWAR, U.M.K., HAMDAN, H., NURMAIZATULHANA, O., NURHAFIZAH, A.G. & MAHANIM, S.M.A. Chemical modification of timber species, *Endospermum malaccense* with propionic anhydride. Pp. 201–205 in Wan Asma, I., Mahanim, S.M.A., Rafidah, J., Zulkafli, H. & Jailani, S. (Eds.) *Proceedings of the Seminar on Biomass for Biofuels and Value Added Products*, 27–28 October 2009, Kuala Lumpur.

## LAPORAN INSTITUSI/INSTITUTIONAL REPORTS

- 1 AHMAD AZARUDDIN, M.N. Laporan Khidmat Nasihat Penambahbaikan Ruang *City & Nature*, Pavilion Malaysia di World Expo 2010, Shanghai, China. Report for the Ministry of Natural Resources and Environment Malaysia. 5 pp.
- 2 AHMAD AZARUDDIN, M.N. & MOHD AFENDI, H. Laporan Cadangan Pemindahan Pokok di Tapak Pembinaan di IKRAM Park. Report for the “Majlis Perbandaran Sepang”. 7 pp.
- 3 CHENG, S. Report on *Psocoptera* Infestation in Packaging Material for PAOS Industries Sdn Bhd. Ref: ENTO/2010/8.
- 4 Consultancy Report (UP 24/2008) of the International Expert to the ITTO Project PD 131/02 Rev.4(I) Training of Forest Practitioners for the Improvement of Forest Industry in Cambodia. 5 October 2010. 40 pp.
- 5 FARAH SHAHANIM, M.M. & SHAMSUDIN, I. Regional Training Workshop on Mangrove Management and Restoration Techniques. Report for the Islamic Educational, Scientific and Cultural Organization (ISESCO) and the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA). 31 pp.
- 6 GAN, K.S. Consultancy Report (UP 24/2008) of the International Expert to the ITTO Project PD 131/02 Rev.4(I) Training of Forest Practitioners for the improvement of Forest Industry in Cambodia. 5 October 2010. 40 pp.
- 7 HAMDAN, H. & ANWAR, U.M.K. Consultancy Report (UP 21/2010). Laporan Analisis Sampel Daripada Ekowood Malaysia Sdn Bhd. 8 June 2010. 22 pp.
- 8 HASHIM, M.N. Establishment of *Sesbania sesban* Plantations Using Wastewater Irrigation for Rehabilitation of Arid Land in the Upper Egypt Region of Arab Republic of Egypt. Report for the Nag-Hamady Fiber Board Company, Cairo, Egypt. 62 pp.
- 9 HASHIM, M.N. & AHMAD ZUHAIIDI, Y. Agroforestry as a Sustainable and Productive Alternative Agricultural System in Malaysia. Report for the Akademi Sains Malaysia as a part of Full Report on Mega Science Framework Study for Sustainable National Development on Agriculture, 2011–2050. 50 pp.
- 10 ISMAIL, H., WAN MOHD. SHUKRI, W.A., KHALI AZIZ, H., FAUZI, P., MARYANNA, L., PANG, K.A., PARID, M. & AHMAD ZUHAIIDI, Y. Laporan Akhir Projek Penghutan Semula Kawasan 10,000 Hektar Hutan Simpan Rantau Panjang dan Hutan Simpan Bukit Tarek, Hulu Selangor. Report for the PKPS. 263 pp.
- 11 ISMAIL, P., KHALI AZIZ, H., AHMAD ALSRAF, A.M., KOH, H.L., NIK MOHD SHAH, N.M., NORCAHAYA, H., AIMI LEE, A. & NGUI, S.K. Ecological and Management Status of Ramin (*Gonystylus* spp.) in Malaysia. Pp. 80–93 in Tajudin, E.K. & Hesti, L.T. (Eds.) *Report on Asian Workshop of the ITTO-CITES Project on Ensuring International Trade in CITES-listed Timber Species is Consistent with their Sustainable Management and Conservation: Gonystylus* spp. (*Ramin*), 1–2 July 2009, Bogor.
- 12 ISMARIAH, A., NURATIFAH, Z., RODZIAH, H. & EMILY, W. GIS Analysis to Delineate Catchments of DID Monitoring Stations and to Estimate Changes in Forest Cover Using NFI-I-IV for Perak, Pahang, Selangor, and Johor States. Report submitted to the Director General JPSM, August 2010. Ibu Pejabat Jabatan Perhutanan, Kuala Lumpur.

- 13 KHALI AZIZ, H., ISMAIL, P., ISMAIL, H., NOR AZLIN, Y., SHAMSUDIN, I., SAMSUDIN, M., MOHD NASIR, H., HAMDAN, O., WOON, W.C. & ASWAD, R. Rancangan Kerja Hutan (RKH) Paya Laut Negeri Selangor (2009–2019). Consultation report for Forestry Department of Selangor. FRIM Consultancy No. UP13/2009. 220 pp.
- 14 KIRTON, L.G. The Selangor Declaration “Conservation of Fireflies” Recommended by Participants of the Second International Firefly Symposium 2010.
- 15 KIRTON, L.G., CHENG, S. & AZMI, M. Simulated Field Tests to Determine the Effectiveness of Anti-Termite Repellents in the Outer Polyethylene Sheaths of Underground Transmission Cables. A First Report for Tenaga Nasional Berhad Research. 13 pp.
- 16 KIRTON, L.G., CHENG, S. & AZMI, M. Simulated field tests to determine the effectiveness of anti-termite repellents in the outer polyethylene sheaths of underground transmission cables. A Second Report for Tenaga Nasional Berhad Research. 5 pp.
- 17 KIRTON, L.G., CHENG, S. & AZMI, M. Simulated field tests to determine the effectiveness of anti-termite repellents in the outer polyethylene sheaths of underground transmission cables. A final Report for Tenaga Nasional Berhad Research. 23 pp.
- 18 LATIFAH, J. Steering Committee on Proficiency Testing. Proficiency Testing Programme for Paper Products, Year 2009–2010. Forest Research Institute Malaysia, Kepong. 51 pp
- 19 MAHANIM, S.M.A., PUAD, E. & RAFIDAH, J. Production of Activated Carbon from Bamboo Using Chemical and Steam Activations. Report for Sciencefund Project Achievement Report 2010, Ministry of Agriculture (MOA). 5 pp.
- 20 MOHAMAD FAKHRI, I., JYANNY, V. & ROZITA, A. Laporan Suku Tahun Komponen 4 (Apr-Jun 2010) Laporan Jawatankuasa Teknikal Mengenai Penyelidikan dan Pembangunan (R&D) Projek Penanaman Bakau dan Spesies Sesuai di Pesisiran Pantai Negara bagi Tahun 2010. 9 pp.
- 21 MOHD AFENDI, H., AZIAN, M. & ISMAIL, H. Laporan mengenai penyelidikan dan pembangunan (R&D) Program Penanaman Pokok Bakau dan Spesies-spesies yang Sesuai di Pesisiran Pantai Negara Bagi Tahun 2008. Bakau FRIM. Pp. 49 dalam Mohd Afendi, H., Azian, M. & Ismail, H. (Eds.) Laporan Jawatankuasa Teknikal Mengenai Penyelidikan dan Pembangunan (R&D) Program Penanaman Pokok Bakau dan Spesies-spesies yang Sesuai di Pesisiran Pantai Negara Bagi Tahun 2008.
- 22 MOHD. ASWAD, R. & AZAHARI, Y. Laporan teknikal ekspedisi “jungle trek” Batu Kurau – Bukit Larut Siri II. Report for Taiping Municipal Council (MPT). 11 pp.
- 23 MOHD. FARID, A. Pemeriksaan Pokok Karas Berpenyakit di Getang, Telemong dan Bkt. Aceh, Paya Akob, Kuala Berang, Terengganu. Report to Gaharu Smallholding, Julai 2010. 6 pp.
- 24 MOHD. FARID, A. & LEE, S.S. Report on Diseased Casuarina at RSGC, Kuala Lumpur. Report to RSGC. June 2010. 6 pp.
- 25 MOHD PARID, M., ISMARIAH, A., LIM, H.F., RODA, J.M., NORLIYANA, A. & ROHANA, A.R. Impacts of signing MOU/ MOA between FRIM and other agencies. December 2010. Report submitted to MFRDB.
- 26 ONG, S.P. & CHENG, S. Laporan Kemajuan Suku Pertama 2010 untuk Jawatankuasa Teknikal R&D Program Penanaman Bakau & Spesies Sesuai di Pesisiran Pantai Negara. 1 p.
- 27 ONG, S.P. & CHENG, S. Laporan Kemajuan Suku Kedua 2010 untuk Jawatankuasa Teknikal R&D Program Penanaman Bakau dan Spesies Sesuai di Pesisiran Pantai Negara. 1 p.
- 28 ONG, S.P. & CHENG, S. Laporan Kemajuan Suku Ketiga 2010 untuk Jawatankuasa Teknikal R&D Program Penanaman Bakau dan Spesies Sesuai di Pesisiran Pantai Negara. 1 p.
- 29 ONG, S.P. & AZMI, M. Report on Beetle Samples from Cabinet. A Report for Master Pest Control. Ref: ENTO/2010/5.
- 30 ONG, S.P. & AZMI, M. Report on Beetle Samples from Wooden Pallets. A Report for Abadi Hygiene Services. Ref: ENTO/2010/4.
- 31 ONG, S.P. & AZMI, M. Report on Stem Borer (*Zeuzera* sp.) Infestation in an *Aquilaria malaccensis* Plantation in Kuala Terengganu. A Report for Zulkifli Mohd Yusuf.
- 32 ONG, S.P. Report on Wood Borer Attack. A Report for 4. Tunas Selatan Consortium Sdn. Bhd. Ref: ENTO/2010/7.
- 33 PHILIP, E. Tree Risk Assessment —Assessment of Trees for Conservation Report for The Pacific Straits Realty Sdn. Bhd, Petaling Jaya, Selangor. FRIM Consultancy No. UP14/2010.
- 34 PHILIP, E. Tree Risk Assessment—Menentukan Kesihatan Pokok-Pokok di Sekitar Kawasan Datai dan Andaman Resorts. The Datai and The Andaman Resorts, Langkawi, Kedah. FRIM Consultancy No. UP07/2010.
- 35 PHON, C.K. Report on Master Pest Control (M) Sdn Bhd on Insect Specimens Found in a Residential House. Ref: ENTO/2010/6.
- 36 PROGRAM KUALITI AIR, BAHAGIAN PERHUTANAN DAN ALAM SEKITAR. Laporan Akhir Projek Pemantauan dan Pengawasan Kualiti Air Sungai bagi Kawasan Hutan Simpan Kekal di Semenanjung Malaysia: Projek Kerjasama JPSM/FRIM. Report for Forestry Department Peninsular Malaysia.
- 37 RAFIDAH, J. Synthesis of Dimethyl Ether (DME) from Woody Biomass Syngas via One Step Synthesis Process over Bi-functional Catalyst. Report for Asia Biomass Energy Researchers Invitation Program 2010, 2 July–28 August 2010. NEF, 19 pp.
- 38 ROHANA, A.R., ISMARIAH, A., LIM, H. F., RODA, J.M., MOHD PARID, M. & AINU SHUHADAH, B. Cost Benefit Analysis of Service-Oriented Units in FRIM—A Case Study: Furniture Testing Laboratory. December 2010. Report submitted to MFRDB.
- 39 RUSHDAN, I., LATIFAH, J., MAHMUDIN, S. & MOHD. NOR M.Y. Characterization of Black Liquor from Eko Pulp & Paper Sdn. Bhd. Oil Palm Empty Fruit Bunch Soda-AQ Pulping. Consultancy Report (Up17/2010). Forest Research Institute Malaysia, Kepong. 11 pp

- 40 SHAHFIZ, M.A. & PAN, K.A. Progress Report on Checklist of Herpetofauna of Malaysia Project to Ministry of Natural Resources and Environment (NRE). 28 April.
- 41 SHAHFIZ, M.A. & PAN, K.A. Progress Report on Checklist of Herpetofauna of Malaysia Project to Ministry of Natural Resources and Environment (NRE). 18 June.
- 42 SHAHFIZ, M.A. & PAN, K.A. Progress Report on Checklist of Inland Vertebrates of Malaysia Project to Ministry of Natural Resources and Environment (NRE). 27 September.
- 43 SHAHFIZ, M.A. & PAN, K.A. Progress Report on Checklist of Herpetofauna of Malaysia Project to Ministry of Natural Resources and Environment (NRE). 1 November.
- 44 SHAHFIZ, M.A. & PAN, K.A. Progress Report on Checklist of Inland Vertebrates of Malaysia Project to Ministry of Natural Resources and Environment (NRE). 1 November.
- 45 SREETHERAN, M. Tree Risk Assessment at the Royal Selangor Golf Club III. Report for the Royal Selangor Golf Club, Kuala Lumpur. Consultancy No. UP 2/2010.
- 46 SREETHERAN, M. Tree Risk Assessment at the Royal Selangor Golf Club IV. Report for the Royal Selangor Golf Club, Kuala Lumpur. Consultancy No. UP 4/2010.
- 47 SREETHERAN, M. Kursus Pencegaman dan Pemeriksaan Pokok Merbahaya bagi Kakitangan Taman Botani Pulau Pinang. Report for Taman Botani Pulau Pinang. Consultancy No. UP 20/2010.
- 48 SREETHERAN, M. Tree Risk Assessment at the Royal Selangor Golf Club V. Report for the Royal Selangor Golf Club, Kuala Lumpur. Consultancy No. UP 29/2010.
- 49 TUMIRAH, K. Proficiency Testing Programme (Interlaboratory Cross Checked) for CCA Treated Timber and CCA Preservative (Paste), Series 01/2010- 15, Year 2009-2010.
- 50 WAN ASMA, I., RAFIDAH, J., SHAHARUDDIN, H., PUAD, E., MAHANIM, S.M.A. Development of an Ethanol Production System Using Oil Palm Sap (Phase 3). Final Report for JIRCAS/NEDO, February. 7 pp.
- 51 WAN MOHD. SHUKRI, W.A. & SHAMSUDDIN, I. Laporan Seminar Projek-projek Penyelidikan FRIM: Ke arah Pengurusan Hutan Secara Berkekalan, 3–5 August 2010. Report for the Ministry of Natural Resources and Environment. 20 pp.
- 52 WAN RASIDAH, K., SHAMSUDIN, I., AZIAN, M., JEYANNY, V., MOHAMAD FAKHRI, I., ROZITA, A., SUHAIMI, W.C. & ADI FAZLY, K. Penilaian Tanah dan Pemantauan Kawasan. 38 pp.
- 53 WAN TARMEZE, W.A. TSoNaMi. Pp. 7 in Mohd Afendi, H., Azian, M. & Ismail, H. (Eds.) Report for Laporan Jawatankuasa Teknikal Mengenai Penyelidikan dan Pembinaan (R&D) Program Penanaman Pokok Bakau dan Spesies-Spesies yang Sesuai di Pesisiran Pantai Negara bagi Tahun 2008. Forest Research Institute Malaysia, Kepong.

#### **ARTIKEL DI DALAM SURAT BERITA/MEDIA/BULETIN DLL ARTICLES IN NEWSLETTERS/MEDIA/BULLETINS ETC**

- 1 ADY FADZLY, K. & MOHAMAD FAKHRI, I. Antara cabaran dan peranan: mengkaji tanah di Sungai Haji Dorani. *FRIM in Focus*, December. Pp.12.
- 2 AHMAD ZUHAI, Y. Penyelidikan silvikultur ladang hutan di FRIM. Buletin Keluaran Khas, Galeri Penyelidikan dan Antikuiti FRIM. Pp. 16.
- 3 AZHARIZAN, M.N., AZIAN, M. & TARIQ MUBARAK, H. Chain-of-custody certification in Malaysia. *FRIM in Focus*, June. Pp.12.
- 4 AZIAN, M. & WAN MOHD SHUKRI, W.A. Memperkasakan pengurusan hutan secara berkekalan. *FRIM in Focus*, September. Pp. 11.
- 5 AZYYATI, A.K. & NAIMAH, C.L. Kem alam sekitar: mendidik remaja tentang alam. *FRIM in Focus*, December. Pp. 13.
- 6 CHAN, Y.M. & SAM, Y.Y. Greening the earth. Tree planting at the Kepong Herbarium building. *FRIM in Focus*, June. Pp.14.
- 7 CHAN, Y.M. *Begonia jiewhoei* — spotted gem found nowhere else. *Malaysian Naturalist* 64(1): 22–23.
- 8 CHAN, Y.M. The palms of Ulu Bendul. *Malaysian Naturalist* 63(4): 37–39.
- 9 CHAN, Y.M., PHON C.K. & KIRTON L.G. Love at first sight—the yellow *Eurema* butterflies. *Malaysian Naturalist* 64(2): 8–9.
- 10 CHEE, B.J. & LAU, K.H. *Balanophora*: the hidden highland parasite with unexplored medicinal properties. *Malaysian Naturalist* 63(4): 20–21.
- 11 CHEE, B.J. & LAU, K.H. The spectacular ginger: *Zingiber spectabile* Griffith. *Malaysian Naturalist* 64(1):12–13.
- 12 CHEW, M.Y. *Utricularia minutissima* Vahl. Flora of Peninsular Malaysia Online Newsletter Volume 64/18 2010, November 24. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 13 CHEW, M.Y. *Utricularia involvens* Ridl. Flora of Peninsular Malaysia Online Newsletter Volume 49/3 2010, April 5. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 14 CHEW, M.Y. *Utricularia vitellina* Ridl. Flora of Peninsular Malaysia Online Newsletter Volume 54/8 2010, August. [http://tfbc.frim.gov.my/subscribe\\_newsletters.html](http://tfbc.frim.gov.my/subscribe_newsletters.html).
- 15 CHEW, M.Y. & SITI MUNIRAH, M.Y. Ecological implications from the naturalisation of *Noxious Cabomba* waterweeds in Malaysia. *Malaysian Naturalist* 63 (2): 19–21.

- 16 CHUNG, R.C.K. The Kepong Herbarium (KEP) Forest Research Institute Malaysia. *Buletin Galeri Penyelidikan dan Antikuiti FRIM*. Pp. 9.
- 17 CHUNG, R.C.K., SOEPADMO, E., KIEW, R., SAW, L.G., TAN, H.S. & NADIAH, I. The long journey to a flora of Malaysia. *FRIM in Focus*, September. Pp. 2-3.
- 18 FLETCHER, C.D. Beyond these yellow walls. *FRIM in Focus*, March. Pp. 6-7.
- 19 FLETCHER, C.D. The numbers tell all. *FRIM in Focus*, March. Pp. 11.
- 20 FLETCHER, C.D. More than just sushi. *FRIM in Focus*, March. Pp. 12.
- 21 GETHA, K. & LILI SAHIRA, H. Unraveling new treatments for neglected diseases. *FRIM in Focus*, September. Pp. 10-11.
- 22 HALIZA, I., NORWATI, M., LOK, E.H., NORLIA, B. & MOHD. ROSLI, H. Treasures of the forest revealed. *FRIM in Focus*, September. Pp. 4-5.
- 23 ISMARIAH, A., ROHANA, A.R., RODA, J.M., LIM, H.F. & MOHD PARID, M. Decision-making and sampling size effect. *EAS Strategic Options No.7. FRIM in Focus*, December. Pp. 15.
- 24 JULIUS, A. *Dolichandrone columnaris* T. Santisuk. Flora of Peninsular Malaysia Online Newsletter Volume 59/13 2010, October 19. [http://www.tfbc.frim.gov.my/subscribe\\_newsletter.html](http://www.tfbc.frim.gov.my/subscribe_newsletter.html).
- 25 JUTTA, M., CHUA, L.S.L. & CHANG, Y.S. The grim reaping of gaharu-a tale of greed, gold and gored trees. *Conservation Malaysia Bulletin* 11: 1-2.
- 26 JUTTA, M., SHALINNEY, L., AZMI, M., ONG, S.P. & SAW, L.G. Weevil knievel pinning down the coleopteran pollinators of Malaysia Cycas. *Conservation Malaysia Bulletin* 11: 3-5
- 27 KANDASAMY, K.I. Tissue cultured banana (e.g. berangan) for commercial-scale plantation. Corporate Agriculture Directory, Yellow Pages, 2010/2011, Pp. 12-13.
- 28 KAVIARASU, M. A clean home a day keeps the snakes away. *FRIM in Focus*, December. Pp.10.
- 29 KAVIARASU, M., SHAHFIZ, M.A., PAN, K.A. & NOR AZLIN, M.F. A Malayan horned frog story: Is it a myth? *FRIM in Focus*. June. Pp.15.
- 30 KIEW, R., YAO, T.L. & KIRTON, L.G. Bukit Gasing's hidden treasure: the golden birdwing butterfly. *Malaysian Naturalist* 63(3): 10-11.
- 31 LILIWIRIANIS, N., NIK AZLINA, A., FARAH SHAHANIM, M.M., SARAH HANIM, R.A. & SUHANOM, Z.A. Comparative study on leaf, petiole and stem morphology of *Araceae* species. Pp. 47-53 in Monograph Series of UiTM Pahang, Research and Innovation, Compilation of Pahang Scholars' Synergy 2(1).
- 32 LAU, K.H. *Senyumia minutiflora* (Ridl.) Kiew & et al. Flora of Peninsular Malaysia Online Newsletter Volume 48/2 2010, April 2. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 33 LAU, K.H. & NOR AZLIN, M.F. Wildlife in the city (a tale of lovey dovey). *Malaysian Naturalist*. 63 (2): 8.
- 34 LAU, K.H. & SAW, L.G. The southernmost location of *Livistona speciosa* in Peninsular Malaysia. *Conservation Malaysia Bulletin* 12. Pp. 3-4.
- 35 LAU, K.H., TAN, A.L., SITI MUNIRAH, M.Y., LEE, C.P., NURNIDA, M.K. & NOR ZUHAILAH, M. Days with Prof. Kamarudin Mat Salleh: an epilogue from his students. *Folia Malaysiana* 11(1): 47-56.
- 36 LEE, S.S. & WINGFIELD, M. Diseases in plantations of *Acacia* and *Eucalyptus* in Asia. In Parrotta, J.A. & Carr, M.A. (Eds.), *Forestry for the Future: Sustaining Society and the Environment*. *International Forestry Review* 12(5): 229.
- 37 LIM, A.T. & PAN, K.A. Huge gathering of barn swallows, *Hirundo rustica* in Simpang Pertang. *Suara Enggang* 18(3): 3.
- 38 LIM, C.L. & YAO, T.L. Feather *Pennisetum*, alien invasion! *Malaysian Naturalist* 63(4): 22-23.
- 39 LOK, E.H. & AHMAD ZUHAI, Y. Tree farming for karas. *FRIM in Focus*, September. Pp. 6-7.
- 40 MOHD AFENDI, H. Keistimewaan senduduk kampung. *Laman Impiana*. Kumpulan Karang kraf Sdn. Bhd., Keluaran November/Disember. Pp. 38-40.
- 41 MOHD AFENDI, H. Senduduk putih misteri si pengasih! *Laman Impiana*. Kumpulan Karang kraf Sdn Bhd, Keluaran November/Disember. Pp. 41-42.
- 42 MOHD AFENDI, H. Senduduk baldu memikat kalbu. *Laman Impiana*. Kumpulan Karang kraf Sdn. Bhd., Keluaran November/Disember. Pp. 43-44.
- 43 MUHAMMAD FIRDAUS, A.S. Sixth Pasoh 50-ha re-census. *FRIM in Focus*, March. Pp. 8-9.
- 44 MUHAMMAD FIRDAUS, A.S. & FLETCHER, C.D. Unearthing the secrets of pasoh. *FRIM in Focus*, March. Pp. 10.
- 45 MUHAMMAD FIRDAUS, A.S. A day in Pasoh. *FRIM in Focus*, March. Pp. 14-15.
- 46 NADA, B., KHOO, V. & KIRTON, L.G. A flash of hope for the fireflies of Kuala Selangor. *FRIM in Focus*, December. Pp. 4-5.
- 47 NADIAH, I. *Bombax valetonii* Hochr. Flora of Peninsular Malaysia Online Newsletter Volume 55/9 2010, August 16. [http://tfbc.frim.gov.my/subscribe\\_newsletters.html](http://tfbc.frim.gov.my/subscribe_newsletters.html).
- 48 NADIAH, I. *Kostermansia malayana* Soegeng. Flora of Peninsular Malaysia Online Newsletter Volume 61/15 2010, November 2. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 49 NADIAH, I. & SITI ERYANI, S. *Neesia kostermansiana* Soepadmo. Flora of Peninsular Malaysia Online Newsletter Volume 63/17 2010, November 19. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 50 NIK ADLIN, N.M.S., WAN TARMEZE, W.A. & KHAIRUL, M. Designing with bakau timber. *FRIM in Focus*, June. Pp. 11.
- 51 NOOR AZLIN, Y. An old giant preserved. Sunday Star, 18 July. Pp. 22.

- 52 NOR EZZAWANIS, A.T. *Tectaria angulata* (Willd.) Copel. Flora of Peninsular Malaysia Online Newsletter Volume 51/5 2010, May 25. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 53 NOR EZZAWANIS, A.T. *Lemmaphyllum accedens* (Blume) Donk. Flora of Peninsular Malaysia Online Newsletter Volume 66/20 2010, December 6. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html)
- 54 ONG, P.T. A one-day affair. *The Orchid Review* 118 (1291): 144–147.
- 55 ONG, P.T. *Thrixspermum raciborskii* J.J.Sm. Flora of Peninsular Malaysia Online Newsletter Volume 60/14 2010, October 27. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 56 PAN, K.A. & NOR AZLIN, M.F. The white-breasted woodswallow *Artamus leucorhynchus* of Kg Hj Dorani. *Conservation Malaysia Bulletin* 12: 7–8.
- 57 PUAD, E. & HASHIM, W.S. Oil palm plywood. *Corporate Agriculture Directory 2010-2011*, TM Info Media Sdn Bhd., Pp.16–17
- 58 RAFIDAH, A.R., KIEW, R., IMIN, K. & ROSDI, M. *Ornithoboea flexuosa*: a restricted gesneriad from Kedah limestone. *Conservation Malaysia* 12: 5–6.
- 59 RAFIDAH, A.R., KIEW, R. & MOHD. HAIRUL, M.A. Rare monotypic limestone genera in Pahang and Kelantan. *Conservation Malaysia Bulletin* 11: 4–5.
- 60 RAFIDAH, A.R. & SYAHIDA EMIZA, S. *Spatholirion ornatum* Ridl. Flora of Peninsular Malaysia Online Newsletter Volume 50/4 2010, May 6.
- 61 RODA, J.M., AHMAD FAUZI, P., LIM, H.F., ROHANA, A.R. & ISMARIAH, A. Malaysia's New Economic Model (NEM) for forest industry: what factors to look at? EAS Strategic Options No. 6, *FRIM in Focus*, September. Pp. 14–15.
- 62 RUSHDAN, I. & IDA SURAINI, A.S. Moulded pulp products from oil palm biomass. *Corporate Agriculture Directory*. TM Info-Media Sdn. Bhd., Kuala Lumpur. Pp. 21–23.
- 63 SAM, Y.Y. *Hoya Coriacea* Blume. Flora Of Peninsular Malaysia Online Newsletter Volume 57/11 2010, September 6. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 64 SHAHARUDDIN, H., WAN ASMA, I., RAFIDAH, J., AZMALISA, T., PUAD, E. & MAHANIM, S.M.A. Biodiesel from biomass. *Malaysia Energy Guide* (Yellow Pages), Pp. 29–30.
- 65 SHAHARUDDIN, H., WAN ASMA, I., RAFIDAH, J., PUAD, E., MAHANIM, S.M.A. & AZMALISA, T. Bio-oil from fast pyrolysis of biomass. *Malaysia Energy Guide* (Yellow Pages). TM Info Media Sdn Bhd., Pp. 63–65.
- 66 SHAHFIZ, M. A. The dazzling Javan. *Malayan Naturalist*. Pp. 10.
- 67 SHAHFIZ, M.A. & KAVIARASU, M. Common treeshrew, is it a squirrel? *FRIM in Focus*, December. Pp. 2–3.
- 68 SHAHFIZ, M.A. & NOR MAZUINA, F.K.N. Tupai-tupai di Titian Kanopi. *FRIM in Focus*, December: Pp. 6–7.
- 69 SITI MUNIRAH, M.Y. *Drosera burmanni* Vahl. Flora of Peninsular Malaysia Online Newsletter 65(19) 2010, November 29. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 70 SUHAIDA, M. *Hopea auriculata* Foxw. Flora of Peninsular Malaysia Online Newsletter 67(21) 2010, December 13. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 71 SYAHIDA EMIZA, S. *Erycibe albida* Prain. Flora of Peninsular Malaysia Online Newsletter 47(1) 2010 March 31. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 72 SYAHIDA EMIZA, S. *Erycibe rheedii* Blume. Flora of Peninsular Malaysia Online Newsletter 52(6) 2010, June 11. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 73 SYAHIDA EMIZA, S. *Begonia tigrina* Kiew. Flora of Peninsular Malaysia Online Newsletter 53(7) 2010, July 30. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 74 TAN, J.P.C. *Impatiens opinata* Craib. Flora of Peninsular Malaysia Online Newsletter 58(12) 2010, September 22. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 75 THI, B.K. & LEE, S.S. Macrofungi of Fraser's Hill: Part 1. *Conservation Malaysia*, a Bulletin Supporting Plant and Animal Conservation Malaysia 2010, 11: 6–8.
- 76 WAN ASMA, I., RAFIDAH, J., SHAHARUDDIN, H., AZMALISA, T., PUAD, E. & MAHANIM, S.M.A. Bioethanol from oil palm biomass. *Malaysia Energy Guide* (Yellow Pages), Pp. 40–41.
- 77 WAN MOHD SHUKRI, W.A. Bagaimana hutan produktif negara kita diurus secara berkekalan. *Dewan Kosmik*. Pp. 6.
- 78 YAO, T.L. *Korthalsella japonica* (Thunb.) Engl. Flora of Peninsular Malaysia Online Newsletter 56(10) 2010, August 23. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).
- 79 YAO, T.L., KIRTON, L.G. & KIEW, R. Bukit Gasing's hidden treasure: the golden Birdwing Butterfly. *Malaysian Naturalist* 63 (3): 10–11
- 80 YAO, T.L. *Thottea tomentosa* (Blume) Ding Hou. Flora of Peninsular Malaysia Online Newsletter 62(16) 2010, November 15. [http://tfbc.frim.gov.my/subscribe\\_newsletter.html](http://tfbc.frim.gov.my/subscribe_newsletter.html).

## KERTAS KERJA/WORKING PAPERS

- 1 ABD LATIF, M., HAMDAN, O. & SHAMSUDIN, I. Cabaran R&D dalam menangani isu-isu terkini dalam sektor perhutanan. Paper presented at the "Wacana Perhutanan", 23 April 2010, Serdang.
- 2 ABD. LATIF, M., RAHIM, S. & MOHD NOR, M.Y. Role of innovation and technology to achieve NATIP aspiration. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.

- 3 ABD LATIF, M., RASADAH, M.A. & MOHD SHAHIDAN, M.A. Research on traditional/herbal medicines: valuable resources for new herbal products: Invited paper presented at the International Pharmaceutical Inspections Symposium (PIC/S)", 10–12 November 2010, Kuala Lumpur.
- 4 ABD. RAHMAN, K, RAZMAN, S., ISMAIL, H., SAMSUDIN, M., WAN MOHD SHUKRI, W.A., NUR SUPARDI, M.N. & POTTS, M. Understanding the impact of timber harvesting on growth, yield and key species dominance of hill dipterocarp forest using simulation model. Paper presented at the "Seminar Projek-Projek FRIM: Ke arah Pengurusan Secara Berkekalan", 3–5 August 2010, Kuantan.
- 5 ABD RAHMAN, K, SAMSUDIN, M. & PUAT, D. Threshold level of harvest for mixed dipterocarp forest: assessment using Pre-F Data. Paper presented at the XXIII IUFRO World Congress, 23–29 August 2010, Seoul.
- 6 ABD RAHMAN, K. Analysis of tree population dynamics using large scale ecological plot. Paper presented at the Workshop on Towards Understanding the Impact of Global Climate Change on Biodiversity and Tropical Rainforests, 3–4 January 2010, University Brunei Darussalam, Brunei Darussalam.
- 7 ABD RAHMAN, K. Establishment, monitoring and data management of Pasoh 50-ha plot. Paper presented at the Workshop on Towards Understanding the Impact of Global Climate Change on Biodiversity and Tropical Rainforests, 3–4 January 2010, University Brunei Darussalam, Brunei Darussalam.
- 8 ABD RAHMAN, K. Population structure and dynamics of trees in Malaysian dipterocarp forest with emphasis on Pasoh 50 ha demography plot. Paper presented at the Pasoh International Symposium: Celebrating 25 Years of Tropical Lowland Forest Research, 10–11 November 2010, Forest Research Institute Malaysia, Kepong.
- 9 ABD RAHMAN, K., FLETCHER, S.C.F., SAMSUDIN, M., SHAMSUDIN, I. & MATTHEW, D.P. Biodiversity assessment and responses to silvicultural practices: experiences from GEF/ITTO targeted research projects in Malaysia. Paper presented at the IUFRO Congress, 23–29 August 2010, Seoul.
- 10 ABD RAHMAN, K., ISMAIL, P. & NUR SUPARDI, M.N. Comparative assessment of carbon stock of Malaysian forests. Paper presented at the International Workshop Forest Dynamics and Carbon Monitoring in Forest Ecosystems in East Asia - Findings from Forest Dynamics Network, 5–8 October 2010, Tokyo.
- 11 ABD RAHMAN, K., RAZMAN, S., ISMAIL, H., SAMSUDIN, M., WAN MOHD SHUKRI, W.A., NUR SUPARDI, M.N. & POTTS, M. Understanding the impact of timber harvesting on growth, yield and key species dominance of hill dipterocarp forest using simulation model. Paper presented at the "Seminar Projek-Projek FRIM: Ke arah Pengurusan Secara Berkekalan". 3–5 August, Kuantan.
- 12 ABD RASHID, L., NOR HADIANI, I. & KHALIJAH, A. Isolation of isoquinoline alkaloids from *Meiogyne virgata* (Blume) Miq. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 13 ABD RASHID, L., NIK MUSAADAH, M., MOHD. JEMAIN, M.R., MOHD RADZI, A., AHMAD SHUKRI, A. & AZMAN, M. Chemical and biological evaluation of water soluble polysaccharide extracts from *Morinda citrifolia* fruits as anti-diabetic candidates. Paper presented at the Project Evaluation and Monitoring (PEM), 22–23 November 2010, Forest Research Institute Malaysia, Kepong.
- 14 ABD RASHID, L., NIK MUSAADAH, M., MOHD. JEMAIN, M.R., MOHD RADZI, A., AHMAD SHUKRI, A. & AZMAN, M. Potential of polysaccharides derived from *Leucaena leucocephala* as anti-diabetic candidates. Paper presented at the Project Evaluation Meeting (PEM), 13–14 April 2010, Forest Research Institute Malaysia, Kepong.
- 15 ABD RAZAK, O., HASHIM, M.N. & AHMAD ZUHAI, Y. Sustainable management of buluh semantan (*G. scortechinii*) natural stands as a short rotation non-timber forest resource. Paper presented at the First National Conference on Natural Resources, 18–19 May 2010, Kota Bahru.
- 16 ABD RAZAK, O., HASHIM, M.N., ROSDI, K. & AHMAD ZUHAI, Y. Effects of harvesting techniques on growth performance of *Gigantochloa scortechinii* (buluh semantan). Paper presented at the Twenty-First Malaysian Society of Plant Physiology Conferences, 13–14 December 2010, Cameron Highlands.
- 17 ABDUL HAMID, S., YANTI, A.K. & ZAMZARINA. Hybrid moulded laminated veneer from oil palm (MLVOP) for furniture components. Paper presented at the Seminar on Innovation in Biocomposites and Paper 2010, 30 November 2010, Kuala Lumpur.
- 18 ABDUL RAHIM, N. & KHALI AZIZ, H. Managing peat swamp forests, the ecosystem functions and local communities—translating ecosystem approach into actions. Paper presented at the XXIII IUFRO World Congress, 23–28 August 2010, Seoul.
- 19 ADACHI, M., ITO, A., ISHIDA, A., WAN RASIDAH, K., LADPALA, P. & YAMAGATA, Y. Carbon budget of tropical forests in Southeast Asia and the effects of deforestation: approach from a process model and field measurements. Paper presented at the American Geophysical Union Meeting, 13–17 December 2010, San Francisco.
- 20 ADACHI, M., ITO, A., WAN RASIDAH, K. & YAMAGATA, Y. Carbon budget in tropical forest and oil palm plantation in Pasoh: Approach from a process model and field measurements. Paper presented at the Pasoh International Symposium, 10–11 November 2010, Forest Research Institute Malaysia, Kepong.
- 21 AHMAD AZARUDDIN, M.N., ADNAN, M. & NOOR AZLIN, Y. Arboriculture in Malaysia: towards best practices in urban forest management. Paper presented at the "Seminar Projek-Projek FRIM: Ke arah Pengurusan Secara Berkekalan". 3–5 August, Kuantan.", 4–5 August 2010, Kuantan.
- 22 AHMAD AZARUDDIN, M.N. & NOOR AZLIN, Y. Urban forestry in Malaysia: keeping abreast with development in South East Asia. Paper presented at the International Conference on Urban Forests and Biodiversity, 25–26 February 2010, New Delhi.

- 23 AHMAD AZIZI, M., JALALUDDIN, H., RUSHDAN, I., HOSSEIN, R., SEYED RASHID, F.H.S., PARIDAH, M.T. & MOHD NOR, M.Y. Evaluation of linerboard properties from Malaysian cultivated kenaf soda-anthraquinone pulp versus commercial pulps. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 24 AHMAD FAUZI, P. Economic impact of value added and taxes on the Malaysian economy due to an increase in world crude oil price: an input-output analysis. Paper presented at “Bengkel DOS”, 1 February 2010, Terengganu.
- 25 AHMAD FAUZI, P. The breakeven analysis producing particle board at Semenanjung Malaysia. Paper presented at the ITTO Seminar, 1 March 2010, Kuala Lumpur.
- 26 AHMAD NAZARUDIN, M.R. Alam sekitar: anda buat anda dapat. Paper presented at the “Bulan Alam Sekitar, Institut Perguruan Bahasa-bahasa Antarabangsa”, 11 March 2010, Kuala Lumpur.
- 27 AMIR SAAIFFUDIN, K., AHMAD ZUHAI, Y. & MOHAMAD AZANI, A. Effects of timing and intensity of first thinning on the naturally regenerated *Acacia mangium* stands. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 28 ANG, C.C., NG, C.C., LEE, S.L., LEE, C.T., TNAH, L.H., & ROZAINAH, M.Z. Isolation and characterization of microsatellite loci of *Jhannesteijsmannia lanceolata* (Arecaceae). Paper presented at the My1Bio Conference, 30–31 October 2010, Kuala Lumpur.
- 29 ANG, L.H., TANG, L.K., HO, W.M., HUI, T.F., THESEIRA, G.W. & LEE, D.K. An assessment of carbon sequestration and phytoremediation potentials of four tropical timber tree species grown on tin tailings. Paper presented at the XXIII IUFRO World Congress, 23–28 August 2010, Seoul.
- 30 ANI, S. & SALMIAH, U. Ramin identification and look-alike species. Paper presented at the National Workshop on Enforcement Compliance for Trade in Ramin, 8–10 December 2010, Kuala Lumpur.
- 31 ANI, S., TUMIRAH, K., SALMIAH, U. & SALAMAH, S. Stem anatomy of tuba (*Derris elliptica*)—rotenone yielding climber plant. Paper presented at the International Symposium on Microscope, 22–24 October 2010, Langkawi.
- 32 ANWAR, U.M.K., HAMDAN, H., ABD LATIF, M., PARIDAH, M.T. & SITI RAFIDAH, M. Manufacturing process of PT-plybamboo and its properties. Paper presented at the FPS Sixty-Fourth, 20–22 June, 2010, Monona Terrace Convention Center, Madison, Wisconsin.
- 33 ANWAR, U.M.K., HAMDAN, H., ABD. LATIF, M., PARIDAH, M.T., & SITI RAFIDAH, M. Effect of weathering on the properties of plybamboo after 1 year exposure. Paper presented at the XXIII IUFRO World Congress, 23–28 August 2010, Seoul.
- 34 AUTILIG, C., JASON, L. & PUAD, E. Green technology in waste recycling: fuel pellet. Paper presented at the International Green Technology and Eco-Products Exhibition and Conference (IGEM) 2010, 14–17 October 2010, Kuala Lumpur.
- 35 AZAHARI, M.Y. Alam semula jadi dan persekitaran. Apakah peranan kita? Paper presented at the “Minggu Alam Sekitar Bersama Majlis Bandaraya Shah Alam”, 12–13 April 2010, Shah Alam.
- 36 AZEYLA, A., SAMSUDIN, M., RODZIAH, H., SADALI, S., ISMAIL, H., MOHD NIZAM, M.S., KHAIRUL ANUAR, H. & ABD LATIF, M. Designing optimum harvesting protocol for the hill dipterocarp forests. Paper presented at the International Seminar on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 37 AZMALISA, T., WAN ASMA, I., ZULKAFI, H. & NORAZWINA, Z. Optimization of glucose production from oil palm trunk via enzymatic hydrolysis. Paper presented at the Second International Conference on Nuclear and Renewable Energy Resources (NURER), 4–7 July 2010, Ankara.
- 38 AZYYATI, A.K. Pokok dan anda. Paper presented at the “Seminar Kanak-Kanak”, 25 March 2010, Ampang, Kuala Lumpur.
- 39 AZYYATI, A.K., NAIMAH, C.L. & NOOR AZLIN, Y. Effectiveness evaluation study on environmental education training among teachers: feedback from participants. Paper presented at the Project Evaluation and Monitoring, 22–23 November 2010, Forest Research Institute Malaysia, Kepong.
- 40 CHANG, Y.S. Multidisciplinary approach to medicinal and aromatic plant research in FRIM. An invited paper presented at the Conference on the Recent Development in Chinese Herbal Medicine, 25–26 January 2010, Nanyang Technological University, Singapore.
- 41 CHEE, B.J., MUHAJIR, H., AMIN, I. & CHONG, P.P. The effect of cocoa polyphenol-rich extract on genetic expression in obese diabetic rats. Post-graduate project presentation, 23 March 2010, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang.
- 42 CHEW, M.Y. & HARON, N.W. *Utricularia* (Lentibulariaceae) habitat diversity in Peninsular Malaysia and its implications for conservation. Paper presented at the Eighth Flora Malesiana Symposium, 23–27 August 2010, Singapore.
- 43 CHEW, M.Y., RAFIDAH, A.R., HARON, N.W. & KIEW, R. New findings from the study of micro-structures using SEM on the flowering plant genera *Chirita* and *Utricularia* of Peninsular Malaysia. Paper presented at the Nineteenth Scientific Conference of the Electron Microscopy Society of Malaysia (EMSM), 14–16 December 2010, Langkawi.
- 44 CHUA, L.S.L. Malaysian threatened plants—from assessment to conservation. Paper presented at the Launch of Flora of Peninsular Malaysia and Flora of Malaysia Seminar, 30 March 2010, Forest Research Institute Malaysia, Kepong.
- 45 FADZUREENA, J. Isolation techniques of active compounds. Paper presented at the Herbal Research Workshop Part 1. Advanced Medical and Dental Institute (IPPT), 8–9 June 2010, Universiti Sains Malaysia, Pulau Pinang.
- 46 FADZUREENA, J. Herbal extraction techniques. Paper presented at the Herbal Research Workshop Part 1. Advanced Medical and Dental Institute (IPPT), 8–9 June 2010, Universiti Sains Malaysia, Pulau Pinang.

- 47 FAUZIAH, A., SALBIAH, M., TAN, A.L., LING, S.K. & CHANG, Y.S. Chemical fingerprinting of three varieties of *Labisia pumila* (Blume) Fern-Vill. for quality control. Paper presented at the Twelfth Medicinal and Aromatic Plants Seminar (12th MAPS), 3–4 August 2010, Forest Research Institute Malaysia, Kepong.
- 48 GAN, K.S. Heat treatment: timber, process and handling. Paper presented at Talk on Heat Treatment of Wood Packing Material, 30 September 2010, Forest Research Institute Malaysia, Kepong.
- 49 GAN, K.S., TAN, J.L. & ZAIRUL AMIN, R. Drying characteristics of tropical plantation-grown timber using the proposed testing methods. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 50 GAN, K.S. & ZAIRUL AMIN, R. Drying of *Acacia mangium* using conventional kiln drying system. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 51 GAN, K.S. & ZAIRUL AMIN, R. Drying of *Acacia mangium*. Paper presented at Planted Forests Technical Workshop, 25 May 2010, Kuching.
- 52 GAN, K.S. & ZAIRUL AMIN, R. Air- and solar-drying characteristic of bakau poles. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 53 GETHA, K., HATSU, M., SHARIN, R., NUR FAIRUZ, M.Y., HEMA, T.G., LILI SAHIRA, H. & MOHD ILHAM, A. Exploration of Malaysian soil actinobacteria for new antibiotics using integrated approach. Paper presented at the National Biotechnology Seminar: Cultivating an Innovative Economy, 24–26 May 2010. Putra World Trade Centre, Kuala Lumpur.
- 54 GETHA, K., HEMA, T.G., MASTURA, M., TAN, A.G.Y., NUR FAIRUZ, M.Y. & LILI SAHIRA, H. Heavy metal tolerance in indigenous actinobacteria isolated from Bidor tin tailings and Pasoh forest soil. Paper presented at the Project Evaluation and Monitoring, 13–15 April 2010, Forest Research Institute Malaysia, Kepong.
- 55 HAMDAN, H. Assessment of veneer peeling. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 56 HAMDAN, H., ANWAR, U.M.K., ABD.HAMID, S. & KHAIRUL, A. Reinforcing veneer with glass fiber into moulded products. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 57 HAMDAN, H., ANWAR, U.M.K., ANA AZRENA, R. & KHAIRUL, A. Some properties of chemically modified sesenduk using propionic anhydride. Paper presented at the Project Evaluation and Monitoring, 13–15 April 2010, Forest Research Institute Malaysia, Kepong.
- 58 HAMDAN, O. Forest biomass and carbon stocks mapping using satellite imageries and issues relating to REDD+ in Malaysia. Paper presented at the Workshop on Methods for Biomass Estimation and Forest-Cover Mapping, 8–12 October 2010, University of Mulawarman, Indonesia.
- 59 HAMDAN, O. Multi-satellites for tropical forest inventory. Paper presented at the Project Evaluation and Monitoring Seminar, 22–24 November 2010, Forest Research Institute Malaysia, Kepong.
- 60 HAMDAN, O. & KHALI AZIZ, H. Forest Stand volume estimation using satellite SAR imagery. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 61 HAMDAN, O. & KHALI AZIZ, H. Vulnerability assessment of coastal zones using geospatial technologies. Paper presented at the Asia and the Pacific Symposium—Vulnerability Assessment to Natural and Anthropogenic Hazards, 7–10 December 2010, Manila.
- 62 HASHIM, M.N., ABD. RAZAK, O. & ROSDI, K. Waste-water irrigated industrial woody plantations for rehabilitation of arid areas in Egypt. Paper presented at the International Symposium on Forestry and Forest Products 2010, 5–7 October 2010, Kuala Lumpur.
- 63 HASHIM, M.N., AHMAD ZUHAI, Y., ROSDI K. & ABD. RAZAK, O. Performance of a nine-year-old stand of sentang (*Azadirachta excelsa*) grown on site with monsoon climate. Paper presented at the Twenty-First Malaysian Society of Plant Physiology Conference, 13–14 December 2010, Cameron Highlands.
- 64 HEMA, T.G., GETHA, K., TAN, A.G.Y., NUR FAIRUZ, M.Y., MUHD SYAMIL, A. & LILI SAHIRA, H. Heavy metal tolerance and antibiotic resistance of *actinomycetes* isolated from tin tailings in Bidor, Perak. Paper presented at the Candidature Defense, 13 April 2010, Universiti Malaya, Kuala Lumpur.
- 65 HO, W.M. & ANG, L.H. Terrestrial C and N stocks in tree stands of a degraded ecosystem. Paper presented at the Project Evaluation and Monitoring, 23–24 November 2010 Forest Research Institute Malaysia, Kepong.
- 66 HUDA FARHANA, M.M., LIM, H.F., TARIQ MUBARAK, H., INTAN NURULHANI, B., MOHD NASIR, H., NORSHAKILA, Y. & MOHD. PARID, M. Socio-economic impacts of mangrove replanting species on the local community at Selangor and Perlis, Malaysia. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 67 HUDA FARHANA, M.M. & VIVIEN, L.L. The perceived impacts of ecotourism development: a case study of local communities in Penang National Park. Paper presented at the International Graduate Tourism Research Conference 2010. 16–17 April 2010, Kuala Lumpur.
- 68 HUDA FARHANA, M.M. & VIVIEN, L.L. Perceived impacts of ecotourism development: the case of local communities in Penang National Park. Paper presented at the National Postgraduate Seminar NAPAS 2010. UiTM, 6–7 July 2010, Shah Alam.
- 69 ISMAIL, H., ABD RAHMAN, K., ISMAIL, P. & HARFENDY, O. Population dynamics and optimum harvest of *Gonystylus bancanus* in production forests of Peninsular Malaysia. Paper presented at the ITTO-CITES Workshop, 1–4 December 2010, Kuantan.

- 70 ISMAIL, P., ABD RAHMAN, K., WAN MOHD SHUKRI, W.A., SAMSUDIN, M. & HARFENDY, O. Development of local volume table for peat swamp in Pekan Forest Reserve, Pahang with special reference to *Gonystylus bancanus* (ramin melawis). Paper presented at the "Seminar Projek-projek Penyelidikan FRIM," 3–7 August 2010, Kuantan.
- 71 ISMAIL, P., ABD RAHMAN, K., WAN MOHD SHUKRI, W.A., SAMSUDIN, M. & HARENDY, O. Development of local volume table for peat swamp in Pekan Forest Reserve, Pahang, with special reference to *Gonystylus bancanus* (ramin melawis). Paper presented at the MAJURUS, 21–22 September 2010, Kuala Terengganu.
- 72 ISMAIL, P., RAJA BARIZAN, R.S., WAN MOHD SHUKRI, W.A. & SALLEH, M. Issues and challenges towards achieving best practices in forest restoration. Paper presented at the Workshop on Natural Forest Management Best Practice in Forest Restoration, 10 November 2010, Kota Kinabalu.
- 73 ISMAIL, P., SHAMSUDIN, I. & KHALI AZIZ, H. Development of indicators for assessing susceptibility of degraded peatland areas to forest fires in Peninsular Malaysia. Paper presented at the Asia and the Pacific Symposium - Vulnerability Assessments to Natural and Anthropogenic Hazards, 7–10 December 2010, Manila.
- 74 ISMARIAH, A., AJAY, S., ALAMGIR, G., KAMAL, B., KLAIROONG, P., PAVITHRA, H., PHILAYVANH, P. & SAOWALAK, H. Estimating passive use values of Malayan tiger. Paper presented at the Economics of Tiger Conservation Course. SCF and Global Tiger Initiative (GTI), 15–19 November 2010, Duke University, North Carolina.
- 75 ISMARIAH, A., VINCENT, J.R., EMILY, W., RODZIAH, H. & NURATIFAH, Z. Impacts of tropical forests on watershed services-evidence from Malaysia. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 76 JEYANNY, V., WAN RASIDAH, K., LEE, S.S. & AHMAD FAUZI, M.S. Effects of arbuscular mycorrhizas (AM) inoculation and fertilization on the growth and nutrient status of *Khaya senegalensis* seedlings. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 77 JULIUS, A. Revision of Capparaceae in Peninsular Malaysia. Paper presented at the Eighth Flora Malesiana Symposium, 23–27 August 2010, Singapore.
- 78 KANDASAMY, K.I., FADHILAH, Z., NOR HASNIDA, H., HALIZA, I., SUN, W.F., YAP, J.W. & SITI SUHAILA, A.R. The prospect of propagating tropical forest species through tissue culture. Paper presented at the IUFRO Kuala Lumpur 2010 Conference, 7–12 March, Kuala Lumpur.
- 79 KHAIRUL KAMILAH, A.K., ZAMREE, M.S., ZULKHAIRI, A., AZRINA, A., NORHAIZAN, M.E., HASNAH, B., TAUFIK HIDAYAT, M., MOKHLAS, M.A.M., KHAIRUNNUR, F.A., FAZALI, F., KAMAL, M.N.H., SHAHIDAN, M.A. & RASADAH, M.A. Nutritional composition and antioxidant activity of Malaysian rice varieties. Paper presented at the Third International Conference on Biotechnology for the Wellness Industry, 8–10 October 2010, Putra World Trade Centre, Kuala Lumpur.
- 80 KHAIRUL KAMILAH, A.K., ZULKHAIRI, A., AZRINA, A., NORHAIZAN, M.E., HASNAH, B., TAUFIK HIDAYAT, M., MOKHLAS, M.A.M., KHAIRUNNUUR, F.A., FAZALI, F., KAMAL, M.N.H., ZAMREE, M.S., SHAHIDAN, M.A. & RASADAH, M.A. Anti-atherosclerotic activity of Malaysian germinated brown rice in cholesterol-fed rabbits. Paper presented at Nineteenth Scientific Conference of the Electron Microscopy Society of Malaysia, 14–16 December 2010, Langkawi.
- 81 KHAIRUL KAMILAH, A.K., ZULKHAIRI, A., AZRINA, A., NORHAIZAN, M.E., HASNAH, B., TAUFIK HIDAYAT, M., MOKHLAS, M.A.M., KHAIRUNNUR, F.A., FAZALI, F., KAMAL, M.N.H., ZAMREE, M.S., SHAHIDAN, M.A. & RASADAH, M.A. Influence of oryzanol and vitamin E on the lipid metabolism in high-fat diet rabbits. Paper presented at the Third International Conference on Biotechnology for the Wellness Industry, 8–10 October 2010, Putra World Trade Centre, Kuala Lumpur.
- 82 KHALI AZIZ, H. & HAMDAN, O. Assessment and monitoring of mangroves using remote sensing. Paper presented at the Training Workshop on Mangrove Management and Restoration Techniques, 26–29 July 2010, Forest Research Institute Malaysia, Kepong.
- 83 KHALI AZIZ, H., HAMDAN, O., MOHD AZAHARI, F., AZHAN SHAH, I., MOHD. NASIR, H. & SAMSU ANNUAR, N. Mapping the distribution of display trees for conservation of firefly habitat—a case study of the mangrove tree, *Sonneratia caseolaris*, in Selangor, Malaysia. Paper presented at the Second International Fireflies Symposium, 2–5 August 2010, Kuala Lumpur.
- 84 KHALI AZIZ, H., MOHD AZAHARI, F., TAN, S.A. & HAMDAN, O. Generation of spatial distribution maps of *Gonystylus bancanus* (ramin) using hyperspectral technology. Paper presented at the ITTO-CITES-FRIM Regional Workshop 2010, 1–4 December 2010, Kuantan.
- 85 KHOO, V. & KIRTON, L.G. Effects of short-term illumination on flash behaviour of the firefly *Pteroptyx tener* in the field. Paper presented at the Project Evaluation and Monitoring, 22–24 November 2010, Forest Research Institute Malaysia, Kepong.
- 86 KHOO, V., NADA, B. & KIRTON, L.G. Monitoring the population of the firefly *Pteroptyx tener* along the Selangor River, Malaysia, for conservation and sustainable ecotourism. Paper presented at the Second International Firefly Symposium: Firefly Conservation: From Science to Practice, 2–5 August 2010, Selangor.
- 87 KIEW, R. & CHUA, L.S.L. Flora of Peninsular Malaysia—synergism between taxonomic revisions and conservation assessments. Paper presented at the Academia Sinica, Taiwan.
- 88 KIEW, R., CHUA, L.S.L. & UMMUL NAZRAH, A.R. Conservation status of *Paraboea* species (Gesneriaceae) in Malaysia. Paper presented at the Eighth Flora Malesiana Symposium, 23–27 August 2010, Singapore.
- 89 KIEW, R., CHUNG, R.C.K., SAW, L.G. & SOEPADMO, E. Flora of Peninsular Malaysia: a new beginning. Paper presented at the Flora of Malaysia Seminar in conjunction with the launching of the Flora of Peninsular Malaysia Series I, Volume 1, Ferns and Lycophytes, 29 March 2010, Forest Research Institute Malaysia, Kepong.

- 90 KIRTON, L.G., KHOO, V. & NADA, B. Monitoring populations of aggregating fireflies using digital image analysis. Paper presented at the Second International Firefly Symposium: Firefly Conservation: From Science to Practice, 2–5 August 2010, Selangor.
- 91 LAI, J.K., SALMIAH, U. & KANDANG, J. Accelerated laboratory decay test. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 92 LAI, J.K., SALMIAH, U. & SAMMY, J. Treatability. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 93 LATIFAH, J., MASTURA, M., RUSHDAN, I. & MAHMUDIN, S. Cellulose modification for potential hygiene paper application. Paper presented at the Project Evaluation and Monitoring (PEM), 13–15 April 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 94 LATIFAH, J., MASTURA, M., RUSHDAN, I. & MAHMUDIN, S. Cellulose modification for potential hygiene paper application. Paper presented at the “Bengkel Pemantauan Projek-projek Science Fund Kluster Industri Bil. 1/2010”, 4 May 2010, Putrajaya.
- 95 LEE, C.T., LEE, S.L., FARIDAH, Q.Z., SIRAJ, S.S., NG, K.K.S. & NORWATI, M. Population genetic study of *Koompassia malaccensis* in Peninsular Malaysia and its implication for conservation. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 96 LEE, C.T., LEE, S.L., NG, K.K.S., TNAH, L.H., NORWATI, M., GOODWIN, W. & IYENGAR, A. 2010. Potential forensic application of DNA profiling in combating illegal logging. Paper presented at the XXIII IUFRO World Congress, 23–28 August 2010, Seoul.
- 97 LEE, S.L. *In situ* conservation of forest genetic resources. Paper presented at the Training Workshop on Conservation and Management of Forest Genetic Resources, 5–9 July 2010, Coimbatore.
- 98 LEE, S.L. Malaysia workshop on forest genetic resources conservation and management. Paper presented at the side event (ITTO funded project) of the XXIII IUFRO World Congress, 23–28 August 2010, Seoul.
- 99 LEE, S.L., NG, K.K.S., CHUA, L.S.L., MATSUMOTO, A., TSUMURA, Y. & HONG, L.T. Conservation strategies of *Hopea subalata*, an extremely rare dipterocarp with apomitic mode of reproduction in Peninsular Malaysia. Paper presented at the CGIAR Project Monitoring 2010, 29–30 April 2010, Sepang.
- 100 LEE, S.L., TNAH, L.H., NG, K.K.S. & HONG, L.T. Ecological genetic investigations toward the conservation of widespread endemic and predominantly outcrossing dipterocarps: a case study of *Neobalanocarpus heimii*. Paper presented at the International Symposium on Biodiversity Sciences: Genome, Evolution and Environment, 31 July 2010–3 August 2010, Nagoya.
- 101 LEE, S.L., TNAH, L.H., NG, K.K.S., TANI, N., SUBHA, B., ROFINA, Y.O., FARIDAH, Q.Z. & FARIDAH, H.I. Timber tracking system of chengal (*Neobalanocarpus heimii*) using DNA approach. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 102 LIM, C.L. *et al.* Preliminary study of flower evolution in *Henckelia* sect. *Boeopsis* and *Salicini* (Gesneriaceae) in Peninsular Malaysia. Paper presented at the Eighth Flora Malesiana Symposium, 23–27 August 2010, Singapore.
- 103 LIM, H.F. Attaining environmental health through food and healthy living: issues and challenges. Paper presented at the National Seminar on Environmental Humanities, 16–17 December 2010, Penang.
- 104 LIM, H.F., HUDA FARHANA, M.M., INTAN NURULHANI, B., MOHD. PARID, M., TARIQ MUBARAK, H., NORSHAKILA, Y., MOHD NASIR, H. & AHMAD FAUZI, P. Local communities’ response to mangrove/rhu replanting and conservation in Peninsular Malaysia. Paper presented at the Training Workshop on Mangrove Management and Restoration Techniques, 26–29 July 2010, Forest Research Institute Malaysia, Kepong.
- 105 LIM, H.F., NORINI, H., NORSHAKILA, Y. & INTAN NURULHANI, B. Experiences in the protection, conservation and utilisation of traditional forest-related knowledge and genetic resources in Malaysia. Paper presented at the National Seminar on Environmental Humanities, 16–17 December 2010, Penang.
- 106 LIM, H.F., NORINI, H., NORSHAKILA, Y., INTAN NURULHANI, B., ZAINON, A.S. & NIK MUSAADAH, M. Documenting forest traditional knowledge of Orang Asli communities in Peninsular Malaysia: a new experience. Paper presented at the Second National Conference on Agrobiodiversity and Sustainable Utilization (NAC-2): Agrobiodiversity for Sustainable Development, 11–13 May 2010, Sabah.
- 107 LIM, H.F., NORINI, H., NORSHAKILA, Y., INTAN NURULHANI, B., ZAINON, A.S., NIK MUSAADAH, M., CHANG, Y.S. & TAN, A.L. Challenges in documenting forest traditional knowledge of Orang Asli communities in Peninsular Malaysia. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 108 LIM, H.F., NORINI, H., NORSHAKILA, Y., INTAN NURULHANI, B., ZAINON, A.S., NIK MUSAADAH, M., CHANG, Y.S., TAN, A.L., & NURNIDA, M.K. Pendokumentasian pengetahuan tradisi (TK) di kalangan Orang Asli Semenanjung Malaysia. Paper presented at the “Seminar Kebangsaan Pengetahuan Tradisi Berkaitan Biodiversiti di Malaysia: Perkongsian Pintar di antara Pembuat Polisi, Agensi Pelaksana dan Komuniti,” 2 December 2010, Forest Research Institute Malaysia, Kepong.
- 109 LIM, N.P.T., HAMDAN, H., PEK, Y.K. & JANUARIE, K. Determination of basic flat sliced veneer properties of *Shorea macrophylla* and *Acacia mangium*. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 110 LIM, S.C., YANG, M.C. & JAMES, J. Guidelines on the wood anatomy and quality studies of tropical plantation timbers. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.

- 111 LING, S.K., SALBIAH, M., TAN, A.L., ZUNOLIZA, A. & NORSHAMILA, S. Development of chemical fingerprints for the pink and white flower forms of *Melastoma malabathricum* L. Paper presented at the International Symposium on Forestry and Forest Products, 5–6 October 2010, Kuala Lumpur.
- 112 LOK, E.H. Teknik Penanaman dan Pengurusan Karas. Paper presented at the “Seminar Kebangsaan dan Pameran Gaharu 2010,” 22–23 March, Serdang.
- 113 LOK, E.H. & ABDULLAH, M. Social community forestry in rural Malaysia: enhancing economic returns. Paper presented at the AKECOP International Community Forestry Course. University of Philippines, 24 January–1 February 2010, Los Banos.
- 114 LOK, E.H. & AHMAD ZUHAI, Y. Penanaman dan pengurusan ladang tanaman karas bagi tujuan pengeluaran gaharu. Paper presented at the “Seminar Perladangan, Perniagaan dan Perdagangan Gaharu,” 6 March 2010, Kuala Lumpur.
- 115 LOK, E.H. & AHMAD ZUHAI, Y. Farm planting of karas (*Aquilaria* spp.) for gaharu (agarwood) and oil production in Malaysia. Paper presented at the International Symposium for Forestry and Forest Products, 5–6 October 2010, Kuala Lumpur.
- 116 MAHANIM, S.M.A. & AHMAD HUSNI, A.Z.A. The production of activated carbon derived from bamboo for supercapacitor and high-end application and the cultivation of bamboo to meet production requirements. Paper presented at the Technofund Application Presentation, 18 July 2010, Seri Kembangan.
- 117 MAHMUDIN, S., LATIFAH, J., AINUN, Z.M.A., MOHD NOR, M.Y., JALALUDDIN, H., PARIDAH, M.T., SINGARAM, A. & HARMAEN, A.S. Pulp and papermaking of kenaf—chipping analysis, pulping, bleaching and papermaking. Paper presented at the Seminar on Innovation in Biocomposite and Paper, 30 November 2010, Kuala Lumpur.
- 118 MAHMUDIN, S., RUSHDAN, I. LATIFAH, J. & MOHD NOR, M.Y. Malaysian experience in research, development and commercialization of pulp and paper from oil palm empty fruit bunches. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 119 MAILINA, J., NOR AZAH, M.A., FADZUREENA, J., SAIDATUL HUSNI, S., ABD MAJID, J., NIK YASMIN, N.Y., MOHD. FARIDZ, Z.P. & AHMAD ABDUL QAYYUM, M. Identification of volatile constituents from fresh samples of *Baekea frutescens* L. Paper presented at the Medicinal and Aromatic Plants Seminar, 3–4 August 2010. Forest Research Institute Malaysia (FRIM), Kepong.
- 220 MAILINA, J., NOR AZAH, M.A., MASTURA, M., MAZURA, P., FADZUREENA, J., SAIDATUL HUSNI, S., SITI HUMEIRAH, A.G., NORULAIMAN, Y., ONG, B.K., ABU SAID, A., ABD MAJID, J., MOHD FARIDZ, Z.P. & NIK YASMIN, N.Y. Utilisation of phytoextracts and essential oils from Malaysian Zingiberaceae and Annonaceae for the development of cosmeceutical product. Paper presented at the Project Evaluation and Monitoring 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 221 MARRYANNA, L., SHAMSUDIN, I. & ABD RAHMAN, K. Pengurusan data-data hidrologi dari Stesen Pemantauan Hidrologi dan Kualiti Air. Paper presented at the “Seminar Projek Penyelidikan FRIM ke arah Pengurusan Hutan Secara Berkekalan,” 3–7 August 2010, Kuantan.
- 222 MARRYANNA, L., SITI AISAH, S., ABD RAHMAN, K. & WAN MOHD SHUKRI, W.A. Soil moisture assessment at the different planting treatments in Tekai Forest Reserve, Pahang. Paper presented at the Malaysian Science and Technology Congress 2010: Scaling New Heights in S&T for Sustainable National Development, 9–11 November 2010, Petaling Jaya.
- 223 MARZALINA, M., MOHD AFENDI, H., NASHATUL ZAIMAH, N.A., NOR ASMAH, H., NADIAH SALMI, N., NORALIZA, A. & WAN TARMEZE, W.A. FRIM's efforts to ensure effective techniques for the establishment of mangrove species planting materials. Paper presented at the Sixth National Seed Symposium, 23–24 March 2010, Putrajaya.
- 224 MARZALINA, M. & WAN TARMEZE, W.A. MYScrim flagship project: a FRIM's effort towards sustainable wood based industries. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 225 MARZALINA, M. & WAN TARMEZE, W.A. MYScrim–OPT—a new industrial material from oil palm trunks. Paper presented at the MTC Timber Talk Series, 2 December 2010, Kuala Lumpur.
- 226 MARZALINA, M., WAN TARMEZE, W.A. & RIDZUAN, M. Challenges and opportunities in bringing engineered lumber technologies to Malaysia. Paper presented at the Panel and Engineered Lumber International Conference and Expo (PELICE 2010), 4–6 February 2010, Atlanta, Georgia.
- 227 MAZURA, M.P., FADZUREENA, J., ADIANA, M.A., NUZIAH, H., ABDULL RASHIH, A., ROHANA, S. & HANI IDAYU, B. Assessment of antiinflammatory activities and phytochemical analysis of selected *Senna* species towards herbal product development. Paper presented at the Project Evaluation and Monitoring (PEM), 13–14 April 2010, Forest Research Institute Malaysia, Kepong.
- 228 MOHAMAD OMAR, M.K., ALIK, D. & MOHD. JAMIL, A.W. Physical and mechanical properties of *Acacia mangium* and *Shorea macrophylla*. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 229 MOHAMAD OMAR, M.K., ALIK, D. & ZAMRI, I. Mechanical properties. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 300 MOHAMAD OMAR, M.K. & MOHD JAMIL, A.W. Classification of timber by non-destructive method for effective structural applications. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 301 MOHD AFENDI, H. & MARZALINA, M. Pemuliharaan paya bakau. Paper presented at the “Bengkel Pemuliharaan Paya Bakau Kenabenua,” 28–30 June 2010, Wilayah Persekutuan Labuan.

- 302 MOHD ASWAD, R., NOOR AZLIN, Y., AZYYATI, A.K. & NAIMAH, L. Environmental Interpretation as an effective learning tool in parks and recreation forests. Paper presented at the Best of Both Worlds Conference: Effective Environmental Education for Biodiversity Conservation, 8-10 November 2010, Kuching.
- 303 MOHD ILHAM, A., ANEE SURYANI, S., SITI SYARIFAH, M.M., NURHANAN MURNI, Y., ASIAH, O., NORHAYATI, I. & LILI SAHIRA, H. Evaluating the effects of *Erythroxylum cuneatum f.cuneatum* (Miq.) Kurz (chinta mula) in morphine addicted rats. Paper presented at the National Biotechnology Seminar 2010: Cultivating an Innovative Economy. 24-26 May 2010, Putra World Trade Centre, Kuala Lumpur.
- 304 MOHD ILHAM, A. & GETHA, K. Bioscreening Strategies for drug discovery from natural products. Paper presented at the International Symposium on Forestry and Forest Products, 5-7 October 2010, Kuala Lumpur.
- 305 MOHD. NASIR, M.A., LEE, Y.H., MUSA, A., SALMIAH, U., SALAMAH, S., TUMIRAH, K. & SHAHRUDIN, H. Design of biosensors based on the fungus *Lentinus Sajor-Caju* for insecticide permethrin detection in treated wood. Paper presented at the Third Penang International Conference for Young Chemist (Penang ICYC) 2010, 23-25 Jun 2010, Universiti Sains Malaysia, Penang.
- 306 MOHD. NASIR, M.A., LEE, Y.H., MUSA, A., SALMIAH, U., SALAMAH, S., TUMIRAH, K. & SHAHRUDIN, H. Design of biosensors for insecticide permethrin detection in treated wood. Paper presented at the International Symposium on Forestry and Forest Products, 5-7 October 2010, Kuala Lumpur.
- 307 MOHD ROSLI, H., MOHD FARID, A., LEE, S.S., AZRIL, D.M.D., BAHARUDIN, K., NORLIA, B., NORWATI, A. & NORWATI, M. Selection of local isolates of white-rot fungi for isolation of genes encoding for lignolytic enzymes. Paper presented at the National Biotechnology Seminar 2010: Cultivating an Innovative Economy, 24-26 May 2010, Putra World Trade Centre, Kuala Lumpur.
- 308 MUHAMMAD SARFI, N., NOR AZAH, M.A., MOHD NASIR, M.A., ABD. MAJID, J. & MOHD. NASIR, T. Clasification of agarwood region using ANN. Paper presented at the 2010 IEEE Control and System Graduate Research Colloquium (ICSGRC 2010), 22 Jun 2010, UiTM, Shah Alam.
- 309 MUHAMMAD SHARFI, N., NOR AZAH, M.A., MOHD NASIR, M.A., ABDUL MAJID, J., MOHD. NASIR, T. & NURHANI, K. Classification of Malaysian and Indonesian agarwood using k-NN. Paper presented at the International Symposium on Forestry and Forest Products, 5-7 October 2010, Kuala Lumpur.
- 310 NADA, B., KIRTON, L.G. & NORMA RASHID, Y. Comparison of firefly larval abundance in three different landscapes along the Selangor River, Malaysia. Paper presented at the Second International Firefly Symposium: Firefly Conservation: From Science to Practice, 2-5 August 2010, Selangor.
- 311 NADIAH, I. & SOEPADMO, E. A synopsis of the genus *Coelostegia* Benth. (Bombacaceae/Malvaceae-Helicterioideae) and new records of *C. griffithii* Benth. from Borneo and *C. montana* Sidiyasa from Sabah. Paper presented at the Eighth International Flora Malesiana Symposium, 23-27 August 2010, Singapore.
- 312 NAIMAH, C.L. Tumbuhan semula jadi: peranan FRIM dalam memelihara dan memulihara. Paper presented at the "Minggu Sains Sosial di Sekolah Menengah Kebangsaan Victoria," 30 August-3 September 2010, Kuala Lumpur.
- 313 NAOKI, T., TSUMURA, Y., FUKUSAWA, K., KADO, T., TAGUCHI, Y., NIIYAMA, K., YAGIHASHI, T., TANOUCHI, H., LEE, S.L., LEE, C.T., NORWATI, M., AZIZI, R. & ABDUL RAHMAN, K. Paternity analysis within undisturbed and selective logged hill dipterocarp forests reveal existence of partial self incompatibility system in *Shorea curtisii*. Paper presented at the International Symposium on Forestry and Forest Products, 5-7 October 2010, Kuala Lumpur.
- 314 NG, C.H., LEE, S.L., NG, K.K.S., LEE, C.T. & NORWATI, M. Establishment of full-sib families in *Shorea platyclados* (Dipterocarpaceae) using paternity analysis—an alternative to controlled pollination. Paper presented at the International Symposium on Forestry and Forest Products, 5-7 October 2010, Kuala Lumpur.
- 315 NG, K.K.S., LEE, S.L., NG, C.H. & LEE, C.T. Development of gene-derived DNA markers of *Shorea leprosula* towards tree improvement and conservation of dipterocarps. Paper presented at the National Biotechnology Seminar 2010: Cultivating an Innovative Economy, 24-26 May 2010, Kuala Lumpur.
- 316 NG, K.K.S., LEE, S.L., TNAH, L.H., NURUL FARHANAH, Z., NG, C.H., LEE, C.T., DIWAY, B. & KHOO, E. Forensic DNA profiling of a CITES listed timber species *Gonystylus bancanus* in Malaysia. Paper presented at the International Symposium on Forestry and Forest Products Research, 5-7 October 2010, Kuala Lumpur.
- 317 NG, K.K.S., LEE, S.L. & UENA, S. Out-crossing tree species is more susceptible to the negative impact of logging. Paper presented at the Pasoh International Symposium: Celebrating 25 years of Lowland Tropical Forest Research, 10-11 November 2010, Forest Research Institute Malaysia, Kepong.
- 318 NIGEL, L., HAMDAN, H., PEK, Y.K. & JANUARIE, K. Determination of basic flat sliced veneer properties of *Shorea macrophylla* and *Acacia mangium*. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23-25 March 2010, Kuala Lumpur.
- 319 NIIYAMA, K., KAJIMOTO, T., MATSUURA, Y.T., YAMASHITA, T., KENZO, T., AZIZI, R. & ABD. RAHMAN, K. Root biomass estimation in a dipterocarp forest, Pasoh Forest Reserve, Peninsular Malaysia. Paper presented at the International Workshop on Forest Dynamics and Carbon Monitoring in Forest Ecosystems in East Asia-Findings from Forest Dynamics Network, 5-8 October 2010, Tokyo.
- 320 NIK MUSAADAH, M. Malaysia: biotechnology for wealth creation (country report). Paper presented at the Symposium on Networking and Technology Transfer, 7-12 June 2010, Bangkok.
- 321 NIK MUSAADAH, M., ABD RASHID, L., MOHAMAD JEMAIN, M.R., AZMAN, M., MOHD RADZI, A., AHMAD SHUKRI, A., RASADAH, M.A. & KHAIRUL JASMANI, J. MBO8PP as a glucose lowering agent. Paper presented at the Symposium on Networking and Technology Transfer, 7-12 Jun 2010, Bangkok.

- 322 NIK MUSAADAH, M., ZAINON, A.S., LING, S.K., ADIANA, M.A., MASTURA, M., FADZUREENA, J., MAIZIRA, H., VIMALA, S., SAIFUL AZMI, J., ROHANA, S., MOHD. JEMAIN, M.R., MAZURAH, M.I., NUZIAH, H., TAN, A.L., NURNIDA, M.K., RASADAH, M.A., NORSHIKILA, Y., INTAN NURULHANI, B., LIM, H.F. & NORINI, H. Kajian bioaktiviti dan fitokimia spesies tumbuhan ubatan terpilih berasaskan pengetahuan tradisi suku Semelai, Tasik Bera, Pahang. Paper presented at the "Seminar Kebangsaan Pengetahuan Tradisi di Malaysia: Perkongsian Pintar di antara Pembuat Polisi, Agensi Pelaksana dan Komuniti," 2 December 2010, Forest Research Institute Malaysia, Kepong.
- 323 NOOR AZLIN, Y. & SHARMILLAH, S. Harmonizing flora and fauna conservation education programmes in urban areas: a reason for botanical and zoological gardens to work together. Paper presented at the AKAA and Edu4PAAZAB Symposium 2010: Linking Zookeepers and Educators to Biodiversity, 15–18 February 2010, Pretoria.
- 324 NOOR AZLIN, Y. Nature tourism: a challenge for sustainability. Paper presented at the Round Table Discussion of Nature Tourism Potentials, 30 October 2010, Genting Highlands.
- 325 NOOR AZLIN, Y. Nurturing a plantation into an urban forest park: it can be done. Paper presented at the Symposium on the History of Parks: Shah Alam: Towards a Sustainable Park Maintenance and The Future of Urban Park in the 21th Century, 17–20 June 2010, Shah Alam.
- 326 NOOR AZLIN, Y., AZYYATI A.K., NAIMAH C.L. & ASWAD, M.R. Environmental interpretation: the opportunity to provide environmental learning for visitors at recreation forests. Paper presented at the "Seminar Penyelidikan FRIM-JPSM", 4–5 August 2010, Kuantan.
- 327 NOOR AZLIN, Y., AZYYATI, A.K. & NAIMAH, L. Urban forests and parks for environmental learning: promoting conservation awareness for the future generation. Paper presented at the IFPRA World Congress 2010, 15–18 November 2010, Hong Kong.
- 328 NOOR AZLIN, Y., NAIMAH C. L., AHMAD AZARUDDIN, M.N., BISTARI, M., AZYYATI A.K. & NOR MARZUINA F.K.N. The Best of Both Worlds for Environmental Education: Outcomes of 2010 Conference. Paper presented at Second Malaysian Environmental Education Conference (my1.EE.conference) 2010, 29 November–4 December 2010, Rainforest Discovery Centre, Sandakan.
- 329 NOR ASMAH, H., NOR HASNIDA, H., NASHATUL ZAIMAH, N.A, NADIAH SALMI, N. & HAMILIAR, H. Development of synthetic seeds for *Acacia* hybrid. Paper presented at the Sixth National Seed Symposium, 23–24 March 2010, Putrajaya.
- 330 NOR ASMAH, H., NORALIZA, A., NASHATUL ZAIMAH, N.A., NADIAH SALMI, N., NOR HASNIDA, H. & MARZALINA, M. Synthetic seed research on selected tropical tree species. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 331 NOR AZAH, M.A., MOHD NASIR, M.A., ABD. MAJID, J. & SALAMAH, S. Application of sensor technologies for forest based industries. Invited oral paper presented at the One Day Colloquium for Sensor Technology for Agriculture and Environmental Applications 2010, 23 December 2010, UNIMAP, Perlis.
- 332 NOR AZAH, M.A. Writing research papers for FRIM. Paper presented at the "Forum Penulisan Buku Autoritatif dan Jurnal," 28 January 2010, Forest Research Institute Malaysia, Kepong.
- 333 NOR AZAH, M.A., LING, S.K., VIMALA, S., ZAMREE, M.S. & RASADAH, M.A. Herbal nutraceuticals from medicinal plants of Malaysia. Paper presented at the Phytocongress 2010: An International Conference on Herbs and Herbo Mineral Formulations, 6–7 February 2010, Sastra University, India.
- 334 NOR AZAH, M.A., MAILINA, J., SAIDATUL HUSNI, S., SITI HUMEIRAH, A.G., ABDUL MAJID, J., MAZURA, P., ZARIDAH, M.Z., MASTURA, M. & FADZUREENA, J. Prospecting for new personal and health care ingredients from some Malaysian aromatic plants. Paper presented at the XXIII IUFRO World Congress, 23–28 August 2010, Seoul.
- 335 NOR AZAH, M.A., MOHD NASIR, M.A., ABDUL MAJID, J., SAIDATUL HUSNI, S. & MAILINA, J. Establishment of chemical and aroma profiles from selected gaharu samples (*Aquilaria*) by chromatographic tools and sensor technology. Paper presented at the Project Evaluation and Monitoring Seminar 2010, 13–14 April 2010, Forest Research Institute Malaysia, Kepong.
- 336 NOOR AINI, Z., RODA, J.M. & AHMAD FAUZI, P. Revealed comparative advantage of Malaysian timber and timber products to Europe. Paper presented at the National Postgraduate Seminar-NAPAS, 6–7 July 2010, UiTM, Shah Alam.
- 337 NOR DATIAKMA, M.A., NORALIZA, A, SYED ZAHIR IDID, S.O.I., MARZALINA, M., HAMZAH, M.S., SAEID REDZA, D.J. & MASTURA, M. Anti-multidrug resistance *Staphylococcus aureus* (MRSA) potential of *Macaranga gigantea*. Paper presented at the Third International Conference on Advancement in Science and Technology 2010 (ICAST 2010), 26–29 November 2010, Kuantan.
- 338 NOR EZZAWANIS, A.T. Comparative anatomy between the genera of Grammitidaceae in Peninsular Malaysia. Paper presented at the Eighth International Flora Malesiana Symposium, 23–27 August 2010, Singapore.
- 339 NOR EZZAWANIS, A.T. Comparative anatomy of Grammitidaceae Genera in Peninsular Malaysia. Paper presented at the Asian Fern Symposium, 15–17 November 2010, Shenzhen.
- 340 NOR EZZAWANIS, A.T., SYAHIDA EMIZA, S., YAO, T.L., CHEW, M.Y., UMMUL NAZRAH, A.R. & KAMARUL HISHAM, M. Interesting findings of seed plants from Gunung Belumut, Johor. Paper presented at the "Seminar Ekspedisi Saintifik Kepelbagaian Biologi Hutan Gunung Belumut, Johor," 1–2 June 2010, Johor Bharu.
- 341 NOR HASNIDA, H., HALIZA, I., FADHILAH, Z., ROZIDAH, K., ROHANI, A. & RASHIDAH, M. Multi-purpose laminar flow specially designed for handling bioreactor. Paper presented at the "Hari Inovasi FRIM 2010," 30 November–1 December 2010, Forest Research Institute Malaysia, Kepong.

- 342 NOR HASNIDA, H., RUSLAN, A., LING, S.K., ABDUL RASHIH, A., NIK MUSAADAH, M., SITI SYARIFAH, M. M., FADHILAH, Z., HALIZA, I., NORWATI, M. & KANDASAMY, K.I. Hairy root culture: a promising source for the production of tongkat ali secondary metabolites. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 343 NORAISHAH, S. & PHILIP, E. Assessment of carbon stocks in mangrove. Paper presented at the International Symposium on Forestry and Forest Products 2010, 5–7 October 2010, Kuala Lumpur.
- 344 NORALIZA, A., ANEE SURYANI, S., NOR DATIAKMA, M.A., NORWATI, A., MARZALINA, M. & NASHATUL, Z.N.A. Proteome profiling of *Aquilaria malaccensis* upon cold stress conditions. Paper presented at the Project Evaluation and Monitoring, 13–15 April 2010, Forest Research Institute Malaysia, Kepong.
- 345 NORALIZA, A., NOR DATIAKMA, M.A., ANEE SURYANI, S., NASHATUL ZAIMAH, N.A., NORWATI, A. & MARZALINA, M. Proteome profiling of *Aquilaria malaccensis* upon cold stress conditions. Paper presented at the e-Science Fund Project Evaluation and Monitoring (Biotechnology Cluster), National Biotechnology Division, MOSTI, 12 October 2010, Putrajaya.
- 346 NORDAHLIA, A.S., KHAIRUL, M., ROHANA, I. & MOHD NOOR, M. Anatomical, physical and mechanical properties of 12-year-old sesenduk clone. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 347 NORHAYATI, A., LING, S.K., NOR AZAH, M.A., MAZURA, M.P., SAIDATUL HUSNI, S., FADZUREENA, J., ONG, B.K., IHSAN SAFWAN, ZAINON, A.S., MOHD. FAIZAL, I.S., KHALIJAH, A. & IBRAHIM ALI, N. Structure activity relationship study on isolated compounds and standardised extract preparation from *Prismatomeris malayana*. Paper presented at the National Biotechnology Seminar 2010, Cultivation an Innovative Economy, 24–26 May 2010, PWTC, Kuala Lumpur.
- 348 NORINI, H., ROHANA, A.R., AHMAD FAUZI, P. & MOHD. PARID, M. A comprehensive information system for sustainability of the wooden furniture industry in Malaysia. Paper presented at the Project Evaluation and Monitoring (PEM), 22–23 November 2010, Forest Research Institute Malaysia, Kepong.
- 349 NORLIA, B., MOHD ROSLI, H., NORWATI, A., MOHD. FADZLI, A., NOR HASNIDA, H., ZAINON, A.S., MOHD NOOR, I. & NORWATI, M. Study of genes related to tongkat ali (*Eurycoma longifolia*) bioactive compound: transcriptome comparison between wild type roots and hairy root culture. Paper presented at the Project Evaluation and Monitoring (PEM), 13–15 April 2010, Forest Research Institute Malaysia, Kepong.
- 350 NORLIA, B., NORWATI, A., MOHD ROSLI, H. & NORWATI, M. Isolation of floral related gene from flowering tissues of teak (*Tectona grandis*). Paper presented at the International Symposium on Forestry and Forest Products 2010, 5–7 October 2010, Kuala Lumpur.
- 351 NORLIA, B., NORWATI, A., MOHD ROSLI, H., NORWATI, M. & NORIHAN, M.S. Isolation of circadian clock integrator genes from teak (*Tectona grandis*). Paper presented at the National Biotechnology Seminar: Cultivating an Innovative Economy, 24–26 May 2010, Kuala Lumpur.
- 352 NORSHAKILA, Y., LIM, H.F. & INTAN NURULHANI, B. Pengetahuan tradisi Orang Asli Semai. Paper presented at the Traditional Knowledge Seminar, 2 December 2010, Forest Research Institute Malaysia, Kepong.
- 353 NORULAIMAN, Y., ONG, B.K., NOR AZAH, M.A. & MOHD IRMAN SYAH, M. Comparison of different plating techniques in microbial enumeration for herbal based product. Paper presented at the Project Evaluation and Monitoring Seminar (PEM), 23 November 2010, Forest Research Institute Malaysia, Kepong.
- 354 NORWATI, A., NORLIA, B., MOHD ROSLI, H., NORWATI, M. & ANEE SURYANI, S. Investigation of CRY (insect resistant) protein expression in transformed teak clone. Paper presented at the National Biotechnology Seminar 2010: Cultivating an Innovative Economy, 24–26 May 2010, Kuala Lumpur.
- 355 NORWATI, A., NORLIA, B., MOHD ROSLI, H., NORWATI, M. & ANEE SURYANI, S. Investigation of CRY (Insect resistant) protein expression in transformed teak clone. Paper presented at the Project Evaluation Meeting (PEM), 13–15 April 2010, Forest Research Institute Malaysia, Kepong.
- 356 NORWATI, A., NORLIA, B., NOR HASNIDA, H., MOHD. ROSLI, H., NORWATI, M., ABDULLAH, R. & NORIHAN, M.S. Development of transgenic forest tree species: FRIM's experience. Paper presented at the International Symposium on Forestry and Forest Products 2010, 5–7 October 2010, Kuala Lumpur.
- 357 NURNIDA, M.K. & NORAINI, T. Kajian anatomi daun Rhizophoraceae. Pembentang oral Kolokium Siswazah ke-10. Penyelidikan Siswazah: Meneroka Perbatasan Ilmu. 23–24 June 2010, Universiti Kebangsaan Malaysia, Bangi.
- 358 ONG, B.K., CHUAH, C.Y., CHAN, L.K., SHAIDA, F.S. & INDRAYANTO, G. In vitro propagation and callus induction of *Kaempferia galanga* L., a popular medicinal ginger used as traditional health supplement. Paper presented at the International Symposium of Forestry and Forest Products 2010, 5–7 October 2010, Kuala Lumpur.
- 359 ONG, B.K., NORULAIMAN, Y., NORHAYATI, A., SAIFUL AZMI, J., ROHANA, S., NOR AZAH, M.A., VIMALA, S., IHSAN SAFWAN, K., ILYANIE, Y., KHOO, M.G.H., MOHD RADZI, A. & MOHD. IRMAN SHAH, M. Evaluation of *Syzygium* species as natural preservative for nutraceutical or cosmeceutical products. Oral presentation at the Twelfth Medicinal and Aromatic Plants Seminar, 3–4 August 2010, Forest Research Institute Malaysia, Kepong.
- 360 ONG, C.B. In house quality control–laboratory testing. Paper presented at the “Kursus Pengenalan Lamselect Kepada Pengusaha”, 21 October 2010, Kuala Lumpur.
- 361 ONG, P.T. Flies as visitors and pollinators of *Bulbophyllum* (Orchidaceae) flowers. Paper presented at the Eighth Flora Malesiana Symposium, 23–27 August 2010, Singapore.
- 362 ONG, S.P. Early detection of invasive species that are potential threat to forest plantations of Malaysia. Paper presented at the Asia Pacific Forest Invasive Species Network Meeting: Pathways of Biological Invasions in Forests, 8–11 June 2010, Thimphu, Bhutan.

- 363 ONG, S.P., KIRTON, L.G. & SAIMAS, A. A note on two bark-feeding caterpillar species on *Khaya ivorensis*. Paper presented at the Project Evaluation and Monitoring, 22–24 November 2010, Forest Research Institute Malaysia, Kepong.
- 365 OTANI, T., YAGIHASHI, T., TANI, N., TANOUCI, H., NIIYAMA, K., AZIZI, R. & ABD. RAHMAN, K. Changes in the structure and species composition of natural and selectively logged hill dipterocarp forests over 16 years in Peninsular Malaysia. Paper presented at the Eighth Flora Malesiana Symposium, 23–28 August 2010, Singapore.
- 366 PHILIP, E. Outcomes of COP15 UNFCCC. Paper presented at the National Workshop Group on Carbon Inventory, 6 January 2010, Putrajaya.
- 367 PHILIP, E. Methodological considerations for forest mitigation projects. Paper presented at the Carbon Flux Workshop, 22–23 March 2010, Jakarta.
- 368 PHILIP, E. The climate debate in Copenhagen and its aftermath: What is in store for the natural rubber industry? Paper presented at the ASEAN Rubber Conference 2010, the Sixth Conference and Exhibition, 17–19 June 2010, Kuala Lumpur.
- 369 PHILIP, E. & ABDUL RAHIM, NIK. Historic emissions from land use change between 1990 and 2007. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 370 PHILIP, E. & NORAISHAH, S. Carbon sequestration and the impact of climate change on mangroves. Paper presented at the Training Workshop on Mangrove Management and Restoration Techniques, 26–29 July 2010, Forest Research Institute Malaysia, Kepong.
- 371 PHILIP, E., ABDUL RAHIM, N. & CHONG, Y.M. Greenhouse gas inventory under Second National Communication. Paper presented at the Technical Workshop Economic of Climate Change, 3–4 August 2010, Putrajaya.
- 372 PHILIP, E. & NORAISHAH, S. Carbon inventory and impacts of climate change on natural ecosystems. Paper presented at the “Seminar Projek-Projek Penyelidikan FRIM-Ke Arah Pengurusan Hutan Secara Berkekalan”, 3–5 August 2010, Kuantan.
- 373 PHILIP, E. Impact of climate change on rainforest. Paper presented at the IRIM Seminar 2010, Climate Change and Forestry Sector: Emerging Issues and Policy Implications, 3 August 2010, University Putra Malaysia, Serdang.
- 374 PHILIP, E. Impacts of climate change on biodiversity and ecosystem. Paper presented at the National Seminar on Biodiversity (MyBioD), 21 June 2010, Kuala Lumpur.
- 375 PHON, C.K. & KIRTON, L.G. Monitoring of the Rajah Brooke’s Birdwing, *Trogonoptera brookiana albescens* (Papilionidae), using digital images of puddling butterflies. Paper presented at the Project Evaluation and Monitoring (PEM), 22–24 November 2010, Forest Research Institute Malaysia, Kepong.
- 376 PHON, C.K. & KIRTON, L.G. Monitoring of the Rajah Brooke’s Birdwing, *Trogonoptera brookiana albescens* (Papilionidae), using digital images of puddling butterflies. Paper presented at the Third Asian Lepidoptera Conservation Symposium, 25–29 October 2010, Coimbatore.
- 377 PUAD, E. & ASMAWI, S. Pelletizing of rice straw—potential solid fuel from agricultural residues. Paper presented at the Technical Committee of MOA Technofund, 17 July 2010, Seri Kembangan.
- 378 PUAD, E. & CHONG, K.T. An Integrated automation system for carbonization and activation from PKS. Paper presented at the Technical Committee of MOA Technofund, 18 July 2010, Seri Kembangan.
- 379 PUAD, E. & FAISAL, A.R. Innovative sustainable upstream management of green fuel feedstock production with effective cultivation and conversion practices in establishing pilot sustainable indigenous renewable green technology feedstock production. Paper presented at Technical Committee of MOA, Technofund 21 July 2010, Seri Kembangan.
- 380 PUAD, E., WAN ASMA, I., SHAHARUDDIN, H., MAHANIM, S. & RAFIDAH, J. Pelletizing of rice straws: a potential solid fuel from agricultural residues. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 381 RAFIDAH, A.R. et al. Revision of *Chirita* (Gesneriaceae) in Peninsular Malaysia. Paper presented at the Eighth Flora Malesiana Symposium, 23–27 August 2010, Singapore.
- 382 RAFIDAH, A.R., CHEW, M.Y., HARON, N.W. & KIEW, R. Chirita and Utricularia as examples of taxon-specific plant sample preparation and micromanipulation for SEM examination. Paper presented at the Nineteenth Scientific Conference of the Electron Microscopy Society of Malaysia (EMSM), 14–16 December 2010, Langkawi.
- 383 RAFIDAH, A.R., CHEW, M.Y., UMMUL NAZRAH, A.R. & KAMARUDIN, S. Diversity, current knowledge and the significance of the flora of Tasik Bera. Paper presented at the “Biodiversiti Seminar PERHILITAN”, 21–24 June 2010, Melaka.
- 384 RAFIDAH, J. Characterization and optimization of enzymatic hydrolysis of lignocellulosic materials for bioethanol production. Paper presented at the Project Evaluation Meeting (PEM), 22–24 November 2010, Forest Research Institute Malaysia, Kepong.
- 385 RAFIDAH, J., MIYAZAWA, T., SAKANISHI, K., MOHD. NOR, M.Y. & WAN ASMA, I. Synthesis of dimethyl ether (DME) from woody biomass syngas via one step synthesis process on bio-functional catalysis. Paper presented at the Seventh Biomass Workshop Asia, 29 November–1 December 2010, Jakarta.
- 386 RAHIM, S. Biomass resources and value-added products: opportunities and prospects for bio-composite products. Paper presented at the MIGHT Partnership, 27 April 2010, Kuala Lumpur.
- 387 RAJA BARIZAN, R.S. & SHAMSUDIN, I. Effectiveness of geotubes as wave breaker in rehabilitating degraded mangrove for coastal protection. Paper presented at the National Coastal Morphology Seminar 2010: The Muddy Coast of Malaysia, 17 June 2010, NAHRIM, Selangor.

- 388 RAJA BARIZAN, R.S., SHAMSUDIN, I., ISMAIL, H. & SITI NORMASLIANA, M.T. Rehabilitation of degraded coastal mangrove using innovative planting techniques. Paper presented at the Regional Training Workshop on Mangrove Management and Restoration Techniques, ISESCO & PERSGA, FRIM, Malaysia, 26–29 July 2010, Forest Research Institute of Malaysia, Kepong.
- 389 RAJA BARIZAN, R.S., SHAMSUDIN, I., ISMAIL, H. & WAN RASIDAH, K. Hasil kajian penanaman bakau di pesisir pantai berisiko tinggi dengan sokongan struktur pemecah ombak (geotiub). Paper presented at the “Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2010: Kepelbagaian Hutan Pesisiran Pantai, Warisan 1 Malaysia”, 5–6 October 2010, Kuching.
- 390 RAJA BARIZAN, R.S. & SITI NORMASLIANA, M.T. Rehabilitation of coastal area using mangrove species through innovative planting techniques. Paper presented at the “Seminar Projek-Projek Penyelidikan FRIM-Ke Arah Pengurusan Hutan Secara Berkekalan”, 3–5 August 2010, Kuantan.
- 391 RASADAH, M.A. R&D in medicinal and aromatic plants (MAPs): FRIM’s experiences. Invited paper presented at the Symposium on Biotechnology, 18 October 2010, University Malaysia Pahang.
- 392 RASADAH, M.A., ABD RASHID, L. & ZAMREE, M.S. Penemuan dalam kajian khasiat pegaga dalam aspek pemakanan dan perubatan. Invited paper presented at the “Seminar Industri Herba Menjana Ekonomi Baru,” 9–11 November 2010, Kementerian Pertanian dan Industri Asas Tani, Putrajaya.
- 393 RASADAH, M.A., CHEE, B.J. & MUHAJIR, H. The effect of tropical plant extracts on insulin-secreting cell-line. Paper presented at the Twelfth Meeting of ASEAN Expert Group on Herbal and Medicinal Plants. 26–27 July 2010, Manila.
- 394 RASADAH, M.A. & NOR AZAH, M.A. Quality control assessment of herbal raw material-agarwood. Paper presented at the Twelfth Meeting of ASEAN Expert Group on Herbal and Medicinal Plants, 26–27 July 2010, Manila.
- 395 RODA, J.M., ROHANA, A.R., TAN, L.L. & ISMARIAH, A. A study on the domestic trade of timber and timber products in Peninsular Malaysia. Paper presented at the Project Evaluation and Monitoring (PEM), 22–23 November 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 396 RODA, J.M., TAN, L.L., FARIDZUL, Y. & NUR’ATIQA, M.S. A study on domestic trade of timber and timber products in Peninsular Malaysia (Interim Report). Paper presented at the Domestic Trade Seminar, 10 December 2010, Kuala Lumpur.
- 397 ROSDI, K., RASIP, A.G., HASHIM, M.N., MOHD PARID, M. & AHMAD ZUHAI, Y. Suitability of growing *Jatropha curcas* L. on BRIS area. Paper presented at the Project Evaluation and Monitoring (PEM), 22–23 November 2010, FRIM, Kepong.
- 398 ROSLINA, N., MANOHAR, M., NOOR AZLIN, Y. & AZYYATI, A.K. Effectiveness of wetlands interpretive learning experiences in affecting school children’s attitude towards scratching on forest trees. Paper presented at the Best of Both Worlds Conference: Effective Environmental Education for Biodiversity Conservation, 8–10 November 2010, Kuching.
- 399 ROZITA, A. & WAN RASIDAH, K. Evaluation of heavy metals in four different soils prior to herbal planting. Paper presented at the Project Evaluation and Monitoring, 13–14 April 2010, Forest Research Institute Malaysia, Kepong.
- 400 ROZITA, A., WAN RASIDAH, K., MOHAMAD FAKHRI, I., WAN HASAN, A. & MOHD IZWAN, J. Modified conductivity method for mangrove swamp soils. Paper presented at the Advances in Soil, Plant and Fertilizer Analysis Seminar (ASPFA) 2010, 19–21 October 2010, Kota Kinabalu.
- 401 RUSHDAN, I. Optimisation of soda-AQ and biopulping of kenaf in producing dissolving pulp for production of viscose rayon. Paper presented at the Project Evaluation and Monitoring (PEM), 13–15 April 2010, Forest Research Institute Malaysia, Kepong.
- 402 RUSHDAN, I., LATIFAH, J. & MAHMUDIN, S. Influence of the soda-anthraquinone pulping parameters on the pulp properties of kenaf (*Hibiscus cannabinus* L.) V36 cultivar in producing rayon grade pulp. Paper presented at the Project Evaluation and Monitoring, 13–15 April 2010, Forest Research Institute Malaysia, Kepong.
- 403 RUSHDAN, I., LATIFAH, J. & SALMIAH, U. Development of viscose rayon fibre from kenaf through biopulping and biobleaching for batik industry in Malaysia. Paper presented at the “Bengkel Pemantauan Projek-projek Science Fund Kluster Industri Bil. 1/2010”, 4 May 2010, Putrajaya.
- 404 RUSHDAN, I., MAHMUDIN, S., LATIFAH, J. & MOHD NOR, M.Y. The potential growth of newsprint and packaging grades from oil palm fibres for China market. Paper presented at the Second International Conference on Oil Palm Biomass (ICOBP 2010), 2–3 August 2010, Kuala Lumpur.
- 405 RUSHDAN, I., SALMIAH, U., LATIFAH, J. & MAHMUDIN, S. Suitability of white-rot fungus *Lentinus sajor-caju* for biochemical pulping of oil palm empty fruit bunches and kenaf. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 406 SAIDATUL HUSNI, S., NOR AZAH, M.A., MAILINA, J., ABD. MAJID, J., NIK YASMIN, N.Y. & MOHD. FARIDZ, Z.P. Determinations of yield extract of *Jasminum* sp. using two different extraction technologies. Paper presented at the Project Evaluation and Monitoring, 13–15 April 2010, Forest Research Institute Malaysia, Kepong.
- 407 SAIFUL AZMI, J., ADIANA, M.A., MASTURA, M. & LING, S.K. Resistance-modifying and inhibitory potential of flavonoids from *Chromolaena odorata* and its derivatives against multidrug-resistant *Staphylococcus aureus* (MRSA) clinical isolates. Paper presented at the Project Evaluation and Monitoring, 13–15 April 2010, Forest Research Institute Malaysia, Kepong.
- 408 SAIFUL AZMI, J., ADIANA, M.A., MASTURA, M. & LING, S.K. Efflux inhibitory activity of selected plant-based alkaloids against methicillin-resistant *Staphylococcus aureus* (MRSA). Paper presented at the Sixth National Pharmacy R&D Conference, 14–16 June 2010, Pulau Pinang.

- 409 SAIFUL AZMI, J., MOHD. FAZLI, M., ABD RASHID, L., MASTURA, M., AHMAD SAZALI, H. & ZURINA, S. Inhibitory activity from novel codonopsinine derivatives against methicillin resistant *Staphylococcus aureus* (MRSA). Paper presented at the UMS Biotechnology Symposium IV, 1–3 December 2010, Biotechnology Research Institute, UMS, Kota Kinabalu.
- 410 SAIFUL ISKANDAR, K., OMAR, H., THAMER, M., YUSOFF, Z.M., ABD RAHMAN, K., NURLFFAH, M.P & HAKIMI, A.H.M. Assessing soil loss using pin erosion method in different slope gradient and forest conditions. Paper presented at the World Engineering Congress 2010, 2–5 August 2010, Kuching.
- 411 SALMIAH, U. & ANI, S. Suitability of *Acacia mangium* as wood feeder strips in durability studies. Paper presented at the Eleventh Symposium of Applied Biology, 13–16 June 2010, Kota Bharu.
- 412 SALMIAH, U., MASTURA, M., SHAHARUDIN, H., MASHITAH, M.D. & MOHD JANI, S. Development of bio-fungicide for wood panel products using secondary metabolites of white rot fungi. Paper presented at the Project Evaluation and Monitoring (PEM), 13–14 April 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 413 SAM, Y.Y., SAW, L.G. & CHUNG, R.C.K. Floras of Southern Thailand and Peninsular Malaysia: affinity and future collaboration. Paper presented at the Conference on Biodiversity of Southern Thailand: Status and Research Direction, 10–12 November 2010, Walailak University, Thailand.
- 414 SAM, Y.Y., TAN, J.P.C., CHAN, Y.M. Germplasm conservation and utilisation of Peninsular Malaysian begonias. Paper presented at the Eighth Flora Malesiana Symposium, 23–27 August 2010, Singapore.
- 415 SAMSUDIN, M., AZEYLA, A., RODZIAH, H., HARRY, Y., ABDUL LATIFF, M., MOHD. NIZAM, M.S., ABD RAHMAN, K., ISMAIL, P., WAN MOHD. SHUKRI, W.A. & ISMAIL, H. Considering spatial distribution in the selection of trees to be felled as an alternative to the cutting limit approach. Paper presented at the “Seminar Projek-Projek FRIM: Ke arah Pengurusan Hutan Secara Berkekalan”, 3–5 August 2010, Kuantan.
- 416 SAW, L.G. Towards the flora of Malaysia—Is this possible? Paper presented at the launch of Flora of Peninsular Malaysia and Flora of Malaysia Seminar, 30 March 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 417 SAW, L.G. Preliminary taxonomic and conservation assessment of non-rattan palms in Peninsular Malaysia. Paper presented at the Eighth Flora Malesiana Symposium, 23–27 August 2010, Singapore
- 418 SHAMSUDIN, I., WAN MOHD SHUKRI, W.A., ISMAIL, H., SALLEH, M. & SADALI, S. Pengurusan hutan secara intensif sebagai langkah meningkatkan pengeluaran kayu bermutu dari hutan simpan pengeluaran. Paper presented at the “Seminar Projek-Projek FRIM: Ke Arah Pengurusan Secara Berkekalan”, 3–5 August 2010, Kuantan.
- 419 SHARMIZA, A., LATIFAH, J., MAHMUDIN, S. & MOHD NOR, M.Y. Establishment of proficiency testing (PT) scheme for paper products: a Malaysian experience. Paper presented at the Sixty Fourth APPITA Annual Conference and Exhibition, 18–21 April 2010, Melbourne.
- 420 SIK, H.S., SARANI, Z., SAHRIM, A. & HO, W.M. The influence of drying temperature on the mechanical and chemical properties of rubberwood (*Hevea brasiliensis*). Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October, Kuala Lumpur.
- 421 SITI AISAH, S., MARRYANNA, L. & SAIFUL, I. Pengenalan kepada hidrologi dan kualiti air. Paper presented at the “Latihan Pengendalian Peralatan dan Pengutipan Data Kualiti Air kepada Jabatan Perhutanan Semenanjung Malaysia”, 27–29 July 2010, Gerik.
- 422 SITI MUNIRAH, M.Y. The current status of *Cabomba* species (Cabombaceae) naturalizing in Peninsular Malaysia and the future challenges. Paper presented at the Eighth Flora Malesiana Symposium, 23–27 August 2010, Singapore.
- 423 SITI SALWANA, H., NORWATI, M., MOHD ROSLI, H., AB RASIP, A.G. & MAHANI, M.C. Application of molecular marker technology in forest plantation industry. Genetic studies of *Endospermum diadenum* using molecular marker techniques. Paper presented at the Let's Talk Science, Biotechnology Programme, 5 March 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 424 SITI SUHAILA, A.R., FADHILAH, Z., YAP, J.W., NOR HASNIDA, H., HALIZA, I. & KANDASAMY, K.I. The role of plant tissue culture in commercial forest plantation programmes. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 425 SITI SUHAILA, A.R., MOHD SALEH, N. & KANDASAMY, K.I. Enhancement of key chemical content of *Aquilaria malaccensis* (karas) through *in vitro* polyploidization. Paper presented at the BioTech Colloquium 2010, 19–20 April 2010, Universiti Putra Malaysia, Serdang.
- 426 SITI SUHAILA, A.R., OMARALI, A.R. & KANDASAMY, K.I. Development of an integrated 'Plant Production Management System (PPMS)' for tissue culture laboratories. Paper presented at the Project Evaluation and Monitoring, 22–24 November 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 427 SITI SYARIFAH, M.M., NURHANAN MURNI, Y., MUHD HAFFIZ, J., MOHD ILHAM, A., ASIAH, O., NORHAYATI, I., LILI SAHIRA, H., ANEE SURYANI, S. & GETHA, K. Cytotoxic evaluation of 17-neriifolin from *Cerbera odollam* against breast cancer cell lines. Paper presented at the National Biotechnology Seminar: Cultivating an Innovative Economy, 24–26 May 2010. Putra World Trade Centre, Kuala Lumpur.
- 428 SOEPADMO, E. Tree flora Sabah and Sarawak-current status. Paper presented at the launch of Flora of Peninsular Malaysia and Flora of Malaysia Seminar, 30 March 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 429 SREETHERAN, M. Development of performance indicators as tools to evaluate the quality of green space: a case from the safety aspects of urban parks in Kuala Lumpur. Paper presented at the ASEAN Conference on Environment-Behaviour Studies, 7–8 July 2010, Kuching.
- 430 SYAHIDA EMIZA, S. *et al.* A taxonomic revision of *Erycibe* (Convolvulaceae) in Peninsular Malaysia. Paper presented at the Eighth Flora Malesiana Symposium, 23–27 August 2010, Singapore.

- 431 TAN, A.L. & LATIFF, A. New key to aid species identification of *Dillenia* L. in Peninsular Malaysia. Paper presented at the Eighth International Flora Malesiana Symposium (FM-8), 23–27 August 2010, Singapore Botanic Gardens, Singapore.
- 432 TAN, A.L., LING, S.K., SALBIAH, M. & CHANG, Y.S. Morphological and phytochemical variations noted on *Melastoma* spp. in Peninsular Malaysia. Paper presented at the Project Evaluation and Monitoring (PEM), 22–24 November 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 433 TAN, A.L., NIK MUSAADAH, M., ZAINON, A.S., CHANG, Y.S., NURNIDA, M.K., NORSHAKILA, Y., INTAN NURULHANI, B., KAFI, M.J., RAZALI, M.H., NIZAM, H.H., RIIZZAL, M.Y., FAIZAL, M.S., LIM, H.F. & NORINI, H. Memperkasa komuniti orang asli dalam usaha pemuliharaan pengetahuan tradisi dan biodiversiti mereka. Paper presented at the “Seminar Kebangsaan Pengetahuan Tradisi di Malaysia: Perkongsian Pintar di antara Pembuat Polisi, Agensi Pelaksana dan Komuniti,” 2 December 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 434 TAN, H.S., CHUNG, R.C.K. & SOEPADMO, E. A synopsis of *Jarandersonia* (Malvaceae-Brownlowioideae). Paper presented at the Eighth International Flora Malesiana Symposium, 23–27 August 2010, Singapore.
- 435 TAN, J.P.C. *et al.* Tissue culture technique for conserving the germplasm of some endangered begonias. Paper presented at the International Symposium on Forestry and Forest Products 2010, 5–7 October 2010, Kuala Lumpur.
- 436 TAN, Y.E. Timber, a reliable structural material? Presented at the MTC Talk Series, 29 September 2010, Malaysian Timber Council (MTC), Menara PGRM, Kuala Lumpur.
- 437 TAN, Y.E., LIM, N.P.T., LIM, S.C., JOSUE, J. & THILAGAWATHY, M. Wood properties and utilization opportunities of selected plantation-grown species in Malaysia. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 438 TAN, Y.E., LIM, S.C. & ANDREW, N.N. Sampling of trees and allocation of logs. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 439 TAN, Y.E., THILAGAWATHY, M., LIM, S.C., KHAIRUL, M., ANDREW, N.N. & JAMES, J. Sampling of sample trees and allocation of logs for the determination of basic properties of wood from tropical forest plantation. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 440 TEE, L.H., LUQMAN CHUAN, A., PIN, K.Y., TEE, L.T., YUS ANIZA, Y. & ABDULL RASHIH, A. Optimization of spray drying process of leaf extract of *Piper betle* L. (sirih). Paper presented at the Twelveth Medicinal and Aromatic Plants Seminar 2010, 3–4 August 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 441 TING, K.B. & ONG, C.B. Determination of finger-jointing and bonding properties of *Shorea macrophylla* and *Acacia mangium*. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 442 TING, K.B. & ONG, C.B. Finger and laminate joints in non-structural timber products. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 443 TNAH, L.H., LEE, S.L., NG, K.K.S., NURUL FARHANAH, Z., NG, C.H., LEE, C.T., DIWAY, B. & KHOO, E. Geographical traceability of a CITES listed timber species *Gonystylus bancanus* in Malaysia. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 444 TNAH, L.H., LEE, S.L., NG, K.K.S., TANI, N., BHASSU, S., OTHMAN, R.Y., FARIDAH, Q.Z. & FARIDAH-HANUM, I. Timber tracking system of chengal using DNA marker. Paper presented at the IUFRO Kuala Lumpur 2010 Conference, 7–12 March 2010, Kuala Lumpur.
- 445 TSUMURA, Y., OHTANI, M., TANI, N., UENO, S., LEE, S.L., NG, K.K.S., NORWATI, M., DIWAY, B., FINKELDEY, R., KHOO, E., KAMIYA, K., HARADA, K., INDRIOKO, S. & NA'ITEM, M. Phylogeographical study of wide-distributed tree species, *Shorea leprosula*, in Southeast Asia. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 446 TUMIRAH, K. Measurement uncertainty for CCA determination in treated wood and wood preservatives. Paper presented at the Measurement Uncertainty Seminar, 30 August 2010, Forest Research Institute, Kepong.
- 447 TUMIRAH, K., SALAMAH, S., SALMIAH, U., ANI, S., MOHD DAHLAN, J. & MOHD NASIR, M.A. Validation and verification method for quantitative analysis of boron content in wood based products and sampling technique. Paper Presented at the PEM 2/2010. 22-24 Okt. 2010. Forest Research Institute, Kepong.
- 448 TUMIRAH, K., SALAMAH, S., SALMIAH, U., MOHD NASIR, M.A., MOHD DAHLAN, J. & ANI, S. Tuba plant (*Derris elliptica*) extract as green wood preservatives for indoor application. Paper presented at the Project Evaluation and Monitoring (PEM), 13–14 April 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 449 UMMUL NAZRAH, A.R., KAMARUDIN, S., SITI MUNIRAH, M.Y. & MOHD. HAIRUL, M.A. A checklist of vascular plants for Gunung Benom, Pahang, Malaysia. Paper presented at the Seminar on Gunung Benom Scientific Expedition 2010, 15–16 June 2010, Putrajaya.
- 450 VINCENT, J.R., ISMARIAH, A., EMILY, W., RODZIAH, H. & NURATIFAH Z. Seeking real-world evidence of ecosystem services of tropical forests. Paper presented at the Beijer Institute Fellow Seminar, 22 September 2010, Beijer Institute, Stockholm.
- 451 VINCENT, J.R., ISMARIAH, A., EMILY, W., RODZIAH, H. & NURATIFAH, Z. Measuring forest hydrological services: are statistical models up to the task? Paper presented at the Technical Briefing, The World Bank. 30 November 2010. Washington DC.
- 452 WAN ASMA, I., PUAD, E., SHAHARUDDIN, H., MAHANIM, S.M.A. & RAFIDAH, J. Information on waste palm trees in Malaysia. Paper presented at the Regional Workshop on Waste Agricultural Biomass, 2–5 March 2010, Osaka.

- 453 WAN MOHD SHUKRI, W.A., ISMAIL, H., HARFENDY, O. & SADALI, S. Improvement of the merchantable heights table for determining volume of standing trees. Paper presented at the “Seminar Projek-Projek FRIM: Ke Arah Pengurusan Secara Berkekalan”, 3–5 August 2010, Kuantan.
- 454 WAN RASIDAH, K., MOHAMAD FAKHRI, I., ROZITA, A., SUHAIMI, W.C., JEYANNY, V. & ADI FADZLY, A.K. Soil profiles of mangrove forests: case studies in Peninsular Malaysia. Paper presented at the Regional Workshop on Mangrove Management and Restoration Techniques, ISESCO/PERSGA-FRIM, 26–29 July 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 455 WONG, T.C., CHAN, C.S., TING, K.B., KHAIRUL, M. & KHAIRUL, A. Sawing and machining. Paper presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 456 YAMASUGE, K., KINOSHITA, M., NOOR AZLIN, Y. & NUMATA, S. Roles of a research institute in communication between research and society: the case of research forests in Malaysia and Japan. Paper presented at the URBIO 2010 International Conference: Urban Biodiversity in the Ecological Network, 18–22 May 2010, Nagoya.
- 457 YAO, T.L. et al. *Loxocarpus* (Gesneriaceae)—Section or genus? Paper presented at the Eighth Flora Malesiana Symposium, 23–27 August 2010, Singapore.
- 458 YAP, J.W., CLYDE, M.M., KANDASAMY, K.I., MADON, M. & KOUTOULIS, A. Colchicine-mediated polyploid induction in *Acacia* for the breeding of seedless triploid trees. Paper presented at the National Biotechnology Seminar 2010: Cultivating an Innovative Economy, 24–26 May 2010, Kuala Lumpur.

## POSTER/POSTERS

- 1 AB RAHMAN, M., SAMAN, H., RIDZUAN, M. & RAHIM, S. Mechanical properties and durability performance of cement bonded particleboard made from *Leucaena leucocephala*. Poster presented at the Twenty Third IUFRO World Congress, 23–28 August 2010, Seoul
- 2 ABD RAZAK, O. Evaluation of bamboos plantation establishment in Bradwell Estate, Seliau, Negeri Sembilan. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 3 ABDUL HAMID, S., YANTI, A.K., HAMDAN, H., SAID, A., RAZALI, A.K. & AZRENA, A.K. Coconut moulded laminated veneer chair. Poster presented at the MTC Global Wood Mart, 19–20 October 2010, Kuala Lumpur
- 4 ABDUL HAMID, S., YAUMIL HIDAYAH, F., RAZALI, A.K., HAMDAN, H., YATI, A.K., AZREENA A.K., ANI, S. & EMLEE, M.T. Selected anatomical and physical properties of coconut lumber. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 5 ADIANA, M.A. & MAZURA, M.P. Study on *Senna alata* and its different extracts by Fourier transform infrared spectroscopy and two-dimensional correlation infrared spectroscopy. Poster presented at the Medicinal and Aromatic Plants Seminar 2010, 3–4 August 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 6 AHMAD NAZARUDIN, M.R., SUHARTI, S. & NOOR AZLIN, Y. Sebasah trail: an educational walk on a wetland ecosystem. Poster presented at the Best of Both Worlds Conference: Effective Environmental Education for Biodiversity Conservation, 8–10 November 2010, Kuching.
- 7 AIDA MARYANI, C.M.N., HAMDAN, H., AMWAR, U.M.K., ANA AZRENA, R. & SEET, B.H. Chemical modification of *Endospermum malaccense* sp. with acetic anhydride. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 8 AINUN, Z.M.A., LATIFAH, J., NURUL IZZATI, N., & NAZLIA, G. Application of precipitated calcium carbonate in the making of alkaline kenaf. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 9 AMINAH, H., TARIQ MUBARAK, H. & AHMAD FAUZI, A.S. Pengaruh hormon ke atas pengakaran keratan propagul bakau minyak (*Rhizophora apiculata*). Poster presented at the “Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2010: Kepelbagaian Hutan Pesisiran Pantai, Warisan 1Malaysia”, 5–6 October 2010, Kota Kinabalu.
- 10 ANA AZRENA, R., HAMDAN, H. & ANWAR, U.M.K. The mechanical properties of *Endospermum malaccense* exposed to weathering. Poster presented at the International Symposium on Forestry and Forest Products (ISFFP) 2010, 5–7 October 2010, Kuala Lumpur.
- 11 ANG, L.H., TANG, L.K., HO, W.M., HUI, T.F. & RAMLI, M. Bioaccumulation of Hg, Pb, As and Cd by pineapple (*Ananas comosus*) var. Giant Kew and its implication as an agroforestry crop for ex-tin mines in Peninsular Malaysia. Poster presented at the Seventh International Pineapple Symposium, 13–15 July, 2010, Persada, Johor Bahru.
- 12 ANI, S. Biodiversity of mangrove species. Poster presented at the Eleventh Symposium of Applied Biology, 13–16 June, Kota Bharu.
- 13 ANI, S. & NORDAHLIA, A.S. Wood anatomy variation, basic density and sapwood percentage of 8-year-old *Khaya ivorensis* grown from rooted cuttings. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 14 ANI, S., TUMIRAH, K., SALMIAH, U. & SALAMAH, S. Stem anatomy of tuba (*Derris elliptica*)—rotenone yielding climber plant. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.

- 15 ANWAR, U.M.K., HAMDAN, H., ANA AZRENA, R., NORDAHLIA, A.S. & SITI RAFIDAH, M. Chemical modification of sesenduk (*Endospermum malaccense*) using propionic anhydride: its dimensional stability. Poster presented at the Twenty Third IUFRO World Congress, 23–28 August 2010, Seoul, Korea.
- 16 AUDI HANI, A., KHAIRUL AZWAN, M., HAMDAN, O. & KHALI AZIZ, H. Analisa perubahan dan taburan hutan paya laut Negeri Johor menggunakan data remote sensing. Poster presented at the “Seminar Pemuliharaan Hutan Pesisiran Pantai Negara 2010”, 5–6 October 2010, Kota Kinabalu.
- 17 AZHARIZAN, M.N., TARIQ MUBARAK, H., ISMAIL, H. & ROHANA, A.R. The chain-of-custody certification award trend in Malaysia since year 2001 to 2009 under Malaysian Timber Certification Scheme. Paper presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 18 AZIAN, M., MARRYANNA, L. & MOHD GHAZALI, H. Kajian kualiti air laut kepada penanaman *Rhizophora* di Tanjung Piai, Johor. Poster presented at the “Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2010: Kepelbagaian Hutan Pesisiran Pantai Warisan 1Malaysia”, 5–6 October 2010, Kota Kinabalu.
- 19 AZYYATI, A.K. Pokok memberi faedah kepada kita. Poster presented at the “Pusat Pendidikan Alam Sekitar (EEC)”, 2010, Forest Research Institute Malaysia, Kepong.
- 20 AZYYATI, A.K., NAIMAH, C.L. & NOOR AZLIN, Y. Student perception and appraisal on nature: feedback from the participants of nature education camp. Poster presented at the Second Malaysian Environmental Education Conference (my1.EE.conference) 2010, 29 November–4 December 2010, Rainforest Discovery Centre, Sandakan.
- 21 CHAN, E.W.C., LIM, Y.Y. & LING, S.K. Isolation and characterisation of bioactive chemical compounds of several species of *Etilingera* (Zingiberaceae) for the development of nutraceutical and cosmeceutical products. Poster presented at the National Biotechnology Seminar, 24–26 May 2010, Putra World Trade Centre, Kuala Lumpur.
- 22 CHONG, Y.M., PHILIP, E. & ABDUL RAHIM, N. National greenhouse gas inventory for land-use change and forestry for Peninsular Malaysia 2008. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 23 FADHILAH, Z. & NEWBURY, J.H. Utilization of chromosome substitution strains (CSS) and stepped aligned inbred recombinant strains (STAIRS) for the identification of genetic regions in *Arabidopsis thaliana* controlling the efficiency of agrobacterium-mediated transformation. Poster presented at the IUFRO Kuala Lumpur 2010 Conference, 7–12 March, Kuala Lumpur.
- 24 FADZUREENA, J., MAZURA, M.P., VIMALA, S., HANI I.B. & NOR FARIZAM, M.N. *In-vitro* anti-inflammatory and antioxidant evaluation of leaf extract of *Baeckea frutescens*. Poster presented at the Medicinal and Aromatic Plants Seminar, 3–4 August 2010, Forest Research Institute Malaysia, Kepong.
- 25 FAUZIAH, A., SAIFUL, A.J., CHEE, B.J., MAZURA, M.P., FADZUREENA, J., VIMALA, S., LING, S.K. & ZAINON, A.S. Phytochemical and biological evaluation of *Piper muricatum* Blume for standardisation towards development of healthcare product. Poster presented at the National Biotechnology Seminar 2010, 24–26 May 2010, Putra World Trade Centre, Kuala Lumpur.
- 26 GAN, K.S. & ZAIRUL AMIN, R. Radio-frequency drying of *Acacia mangium*. Poster presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25, March 2010, Kuala Lumpur.
- 27 GAN, K.S. & ZAIRUL AMIN, R. The influence of board thickness and density on the drying characteristics of wood dried using radio-frequency/vacuum system. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 28 HAMADA, T., YONEDA, T., OKUDA, T. & WAN RASIDAH, K. Soundness assessment of canopy trees at the 50-ha plot in the Pasoh Forest Reserve, Peninsular Malaysia. Poster presented at the Association for Tropical Biology and Conservation Meeting (ATBC), 20–23 July 2010, Bali.
- 29 HEMA, T.G., GETHA, K., TAN, A.G.Y., LILI SAHIRA, H., NUR FAIRUZ, M.Y. & MUHD SYAMIL, A. Correlation of heavy metal tolerance and antibiotic resistance in *Actinobacteria* strains isolated from heavy metal contaminated area. Poster presented at the My1Bio Conference 30–31 October 2010, Kuala Lumpur.
- 30 HEMA, T.G., GETHA, K., TAN A.G.Y., NUR FAIRUZ, M.Y., MUHD SYAMIL, A. & LILI SAHIRA, H. Heavy metal tolerance profiling of *Actinobacteria* strains isolated from heavy metal contaminated and non-contaminated area. Poster presented at the Universiti Malaysia Sabah Symposium IV, 1–3 December 2010, Universiti Malaysia Sabah, Sabah.
- 31 HO, W.M. & ANG, L.H. Carbon pool of an *Acacia mangium* stand established on a degraded ecosystem. Poster presented at the XXIII IUFRO World Congress, 23–28 August 2010, Seoul.
- 32 HO, W.M., ANG, L.H. & LEE, D.K. Production of kenaf (*Hibiscus cannabinus* L.) on tin tailings and its potential for phytoremediation. Poster presented at the XXIII IUFRO World Congress, 23–28 August 2010, Seoul.
- 33 HOW, S.S., CARRADINE, D., WILLIAMSON, C.J., CAMBRIDGE, J. & TAN, Y.E. Predicting modulus of elasticity of short length New Zealand radiata pine finger joint shooks using flexural vibration method. Poster paper presented at SWST Convention, 11–15 October 2010, Geneva.
- 34 HOW, S.S., WILLIAMSON, C.J., TAN, Y.E. & CARRADINE, D. A Conceptualization in computer simulation of processing radiata pine finger-jointed wood and glued-laminated lumber. Poster presented at SWST Convention, 11–15 October 2010, Geneva.
- 35 INTAN NURULHANI, B., HUDA FARHANA, M.M., NORSHAKILA, Y., LIM, H.F., TARIQ MUBARAK, H., MOHD PARID, M. & MOHD NASIR, H. Masalah sosio-ekonomi dan langkah penyelesaian berkaitan penanaman bakau dan rhu di lima buah negeri di Semenanjung Malaysia. Poster presented at the “Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2010”, 5–6 Oktober 2010, Kota Kinabalu.

- 36 INTAN NURULHANI, B., NORSHAKILA, Y., LIM, H.F., NIK MUSAADAH, M., ZAINON, A.S., CHANG, Y.S. & TAN, A.L. An experience in documenting forest related traditional knowledge of Orang Asli communities through capacity building workshops. Poster presented at the Twelfth Medicinal and Aromatic Plants Seminar, 3–4 August 2010, Forest Research Institute Malaysia, Kepong.
- 37 JALALUDDIN, H., AHMAD AZIZI, M., PARIDAH, M.T., RUSHDAN, I., SEYED RASHID, F.H.S., HOSSEIN, R., AINUN, Z.M.A. & HARMAEN, A.S. Comparison of kenaf whole pulp versus softwood pulp and mechanical treatment (beating) to improve old corrugated board (OCC). Poster presented at the “Pameran Reka Cipta, Penyelidikan dan Inovasi UPM 2010”, 20–22 July 2010, Serdang.
- 38 JALALUDDIN, H., AHMAD AZIZI, M., PARIDAH, M.T., RUSHDAN, I., SEYED RASHID, F.H.S., HOSSEIN, R., AINUN, Z.M.A. & HARMAEN, A.S. Evaluation of linerboard properties from Malaysian cultivated kenaf soda-anthraquinone pulps versus commercial pulps. Poster presented at the “Pameran Reka Cipta, Penyelidikan dan Inovasi UPM 2010”, 20–22 July 2010, Serdang.
- 39 JALALUDDIN, H., AHMAD AZIZI, M., PARIDAH, M.T., RUSHDAN, I., SEYED RASHID, F.H.S., HOSSEIN, R., AINUN, Z.M.A. & HARMAEN, A.S. New approach to use kenaf for paper and paperboard production. Poster presented at Pameran Reka Cipta, Penyelidikan dan Inovasi UPM 2010, 20–22 July 2010, Serdang, Selangor.
- 40 JALALUDDIN, H., AHMAD AZIZI, M., PARIDAH, M.T., RUSHDAN, I., SEYED RASHID, F.H.S., HOSSEIN, R., AINUN, Z.M.A. & HARMAEN, A.S. Soda-anthraquinone pulp from Malaysian cultivated kenaf for linerboard production. Poster presented at the “Pameran Reka Cipta, Penyelidikan dan Inovasi UPM 2010”, 20–22 July 2010, Serdang.
- 41 JALALUDDIN, H., AHMAD AZIZI, M., RUSHDAN, I., HOSSEIN, R., PARIDAH, M.T., AINUN Z.M.A. & NAZLIA, G. New approach to use kenaf for paper and paperboard production. Poster presented at BIOMALAYSIA 2010, 1–3 November 2010, Kuala Lumpur.
- 42 JEYANNY, V. & SHARMILLAH, S. Poster pendidikan: pokok tanpa tanah, tiada hidupan. Poster presented at the “Pusat Pendidikan Alam Sekitar (EEC)”, Forest Research Institute Malaysia, Kepong. 2010.
- 43 JOANN, C.L. & FLETCHER, C.D. Size effect of virgin jungle reserves on insectivorous bat assemblages in Peninsular Malaysia. Poster presented at the Association for Tropical Biology and Conservation (ATBC) International Conference 2010, 19–23 July 2010, Bali.
- 44 JOANNA, M.T., NIK MUSAADAH, M., EVA, M.K. & RAKESH, C. NADPH oxidase derived ROS contribute to the pathogenesis of diabetic retinopathy. Poster presented at the Sixtieth British Microcirculation Society Annual Meeting, 19–20 April 2010, Peninsular College of Medicine and Dentistry, University of Exeter and Plymouth, United Kingdom.
- 45 KHAIRUL AZWAN, M., AUDI HANI, A., HAMDAN, O. & KHALI AZIZ, H. Analisa perubahan kawasan hutan paya laut Negeri Perak menggunakan data Spot-5 dan Landsat-TM 5. Poster presented at the “Seminar Pemuliharaan Hutan Persisiran Pantai Negara 2010”, 5–6 October 2010, Kota Kinabalu.
- 46 KHAIRUL KAMILAH, A.K., HADA MASAYU, I., ZULKHAIRI, A., AZRINA, A., NORHAIZAN, M.E., HASNAH, B., TAUFIK HIDAYAT, M., MOKHLAS, M.A.M., KHAIRUNNUR, F.A., FAZALI, M.N.F., ZAMREE, M.S., SHAHIDAN, M.A. & RASADAH, M.A. Hypercholesterolemic effect of malaysian rice varieties on rabbit induced-with hypercholesterolemia. Poster presented at the International Conference on Biotechnology for the Wellness Industry, 8–10 October 2010, Putra World Trade Centre, Kuala Lumpur.
- 47 KHAIRUL KAMILAH, A.K., HADA MASAYU, I., ZULKHAIRI, A., AZRINA, A., NORHAIZAN, M.E., HASNAH, B., TAUFIK HIDAYAT, M., MOKHLAS, M.A.M., KHAIRUNNUR, F.A., FAZALI, M.N.F., ZAMREE, M.S., SHAHIDAN, M.A. & RASADAH, M.A. Atheromatus plaque formation in rabbits induced with high fed-diet. Poster presented at the Scientific Conference of the Electron Microscopy Society of Malaysia. 14–16 Disember 2010, Langkawi.
- 48 KHAIRUL, M., MOHD. NOOR, M., MOHAMAD OMAR, M.K., ABDUL HAMID, S., MOHD HAFIZ, M., KHAIRUL, A. & IZRAN, K. Sesenduk clone: another future timber? Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 49 KHOO, V. & KIRTON, L.G. The application of digital photography to study group display behaviour in aggregating fireflies—a preliminary test based on nocturnal activity rhythm of *Pteroptyx tener*. Poster presented at the Second International Firefly Symposium: Firefly Conservation: From Science to Practice, 2–5 August 2010, Selangor.
- 50 KIEW, R., CHUNG, R.C.K., SAW, L.G. & SOEPADMO, E. Flora of Peninsular Malaysia Project. Poster presented at the Eighth Flora Malesiana Symposium, 23–27 August 2010, Singapore.
- 51 LATIFAH, J., RUSHDAN, I., MASTURA, M. & MAHMUDIN, S. Grafting of polyhexamethylene guanidine hydrochloride (PHGH) onto cellulose pulp: effects of grafting conditions. Poster presented at the International Symposium on Forestry and Forest Products 2010, 5–7 October 2010, Kuala Lumpur.
- 52 LEE, C.T., LEE, S.L., FARIDAH, Q.Z., SIRAJ, S.S., NG, K.K.S. & NORWATI, M. Microsatellite diversity and population genetic structure of *Koompassia malaccensis* in Peninsular Malaysia. Poster presented at the IUFRO Kuala Lumpur 2010 Conference, 7–12 March, Kuala Lumpur.
- 53 LEE, K.F., ONG, P.T., KIEW, R. & TAM, S.M. Molecular phylogeny of *Bulbophyllum* (Orchidaceae) from Peninsular Malaysia—implication for pollinator-floral traits co-evolution. Poster presented at the Eighth Flora Malesiana Symposium, 23–27 August 2010, Singapore.
- 54 LEE, S.L. Conservation and sustainable utilization of forest genetic resources in Asia and the Pacific: Malaysia. Poster presented at the side event (Asia-Pacific Forest Genetic Resources) of the XXIII IUFRO World Congress, 23–28 August 2010, Seoul.

- 55 LEE, S.L., NG, K.K.S., TNAH, L.H., LEE, C.T., NORWATI, M., SAW, L.G., CHUA, L.S.L., TANI, N., TSUMURA, Y., MATSUMOTO, A., KOSKELA, J. & HONG, L.T. Ecological genetics investigations of dipterocarps with different life history traits. Poster presented at the Conference on Forest Ecosystem Genomics and Adaptation, 9–11 June 2010, San Lorenzo de El Escorial, Madrid.
- 56 LEE, S.L., TNAH, L.H., NG, K.K.S., TANI, N., BHASSU, S., OTHMAN, R.Y., FARIDAH, Q.Z. & FARIDAH HANUM, I. Timber tracking system of chengal (*Neobalanocarpus heimii*) using DNA approach. Poster presented at the National Biotechnology Seminar, 24–26 May 2010, Kuala Lumpur.
- 57 LILI SAHIRA, H., GETHA, K., MOHD ILHAM, A., HEMA, T.G., NUR FAIRUZ, M.Y., SITI SYARIFAH, M.M., NORHAYATI, I., MUHD. HAFFIZ, J., ANEE SURYANI, S. & ROSHAN JAHN, M.S. Growth profile of selected actinobacteria isolate and their antitrypanosomal activity. Poster presented at the Malaysian Society of Parasitology and Tropical Medicine, Forty-Sixth Annual Scientific Seminar: Infectious Diseases from Epidemic to Pandemic, 24–25 March 2010, Kuala Lumpur.
- 58 LILI SAHIRA, H., GETHA, K., MOHD ILHAM, A., MUHD SYAMIL, A., NORHAYATI, I., MUHD. HAFFIZ, J., HEMA, T.G., SITI SYARIFAH, M.M. & NUR FAIRUZ, M.Y. Scale-up fermentation and bioassay-guided fractionation of selected actinobacteria isolate active on *Trypanosoma brucei* Bruce. Poster presented at the International Symposium of Health Sciences (i-SIHAT 2010), 9–10 December 2010, Kuala Lumpur.
- 59 LIM, S.C. & GAN, K.S. The percentage of sapwood, density variation and anatomical features of 20-year-old *Acacia mangium* planted in Peninsular Malaysia. Poster presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 60 LIM, S.C. & GAN, K.S. The percentage of sapwood, density variation and anatomical features of 16-year-old *Acacia mangium* planted in Peninsular Malaysia. Poster presented at the International Symposium on Forestry and Forest Products 2010, 5–7 October 2010, Kuala Lumpur.
- 61 LING, S.K., TAN, H.P., LEE, S.L., TNAH, L.H., SALBIAH, M., NURAINI, A.M. & CHUAH, C.H. Development of chemical and genetic fingerprints of *Phyllagathis rotundifolia* and *P. praetermissa* for rapid identification and discrimination of raw and processed materials and their finished products. Poster presented at the National Biotechnology Seminar, 24–26 May 2010, Putra World Trade Centre, Kuala Lumpur.
- 62 MAHANIM, S.M.A., RAFIDAH, J., PUAD, E., WAN ASMA, I. & SHAHARUDDIN, H. Potential application of bamboo activated carbon in supercapacitor industry. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 63 MARRYANNA, L., AHMAD SAHAR, Y., IBHARIM, H., ROSHIDI, R., ABU HUSIN, H. & ABD RAHMAN, K. Hydrological observation at Gunung Benom Forest Reserve, Pahang. Poster presented at the “Seminar Ekspedisi Saintifik Gunung Benom”, 15–16 June 2010, Putrajaya.
- 64 MARRYANNA, L., SITI AISAH, S., ABD RAHMAN, K. & WAN MOHD. SHUKRI, W.A. Availability of soil water content (SWC) under different planting soil medium treatments at Tekai F.R, Pahang. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 65 MARZALINA, M., WAN TARMEZE, W.A. & MOHD NOR, M.Y. MYScrim-OPT: The innovative ‘waste-to-wealth’ construction material from oil palm trunk biomass. Invention and poster presented at the Bio Malaysia 2010 Conference and Exhibition, 1–3 November 2010, Kuala Lumpur.
- 66 MOHAMAD FAKHRI, I., ADI FADZLY, A.K., JEYANNY, V., WAN RASIDAH, A.K. & SUHAIMI, W.C. Monitoring soil movements in the Sg. Besar, Selangor coastal area. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 67 MOHD AZAHARI, F., KHALI AZIZ, H. & AZHAN SHAH, I. Hyperspectral image analysis at canopy scales. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 68 MOHD GHAZALI, H., ISMAIL, P., ABD RAHMAN, K., MARRYANNA, L., ABDUL RAZAK, O., KHALI AZIZ, H., SALLEH, M. & SAIFUL ISKANDAR, K. Impact of logging on plant structure in peat swamp forest. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 69 MOHD HAFIZ, M., MOHD. ARIF, J. & ABDUL HAMID, S. Mechanical properties of hybrid oil palm-rubberwood engineered veneer lumber (HOPREV). Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 70 MOHD IRMAN SHAH, M., NORULAIMAN, Y., ONG, B.K. & NOR AZAH, M.A. Penentuan paras kandungan mikroorganisma dalam bahan mentah dan ekstrak spesies *Syzygium* terpilih. Poster presented at the Medicinal and Aromatic Plants Seminar (MAPS 2010), 3–4 August 2010, Forest Research Institute Malaysia, Kepong.
- 71 MOHD RADZI, A., NURUL AINI, A., AHMAD SHUKRI, A. & ABDUL RASHID, L. Comparative study of effectiveness varying extraction times and solvent ratios of Eurycomane extraction times and ratios of Eurycomanone extraction from tongkat ali. Poster presented at the Twelfth Medicinal and Aromatic Plants Seminar, 3–4 August 2010, Forest Research Institute Malaysia (FRIM), Kepong.
- 72 MOHD RAZMAN, S., TAN, S.A., KHALI AZIZ, H. & SHAHRULZAMAN, I. Stand structure at flat, slope and riverine areas in the logged-over lowland dipterocarp forest, Berkelah FR, Pahang. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 73 MOSS, I., ABD RAHMAN, K. & VALERIE, M. Pasoh Research Forest: a demonstration of structural classification and a preliminary framework for biodiversity assessment guidelines. Poster presented at the Pasoh International Symposium: Celebrating 25 years of Tropical Lowland Forest Research, 10–11 November 2010, Forest Research Institute Malaysia, Kepong.

- 74 NADA, B., LESLEY, B., KIRTON, L.G. & NORMA RASHID, Y. Discovery of an additional species of firefly along the Selangor River, Malaysia, based on morphologically distinct larvae. Poster presented at the Second International Firefly Symposium: Firefly Conservation: From Science to Practice, 2–5 August 2010, Selangor.
- 75 NADIAH SALMI, N., NASHATUL ZAIMAH, N.A., NOR ASMAH, H. & NORALIZA, A. Change in fruiting pattern of *Hopea odorata* (merawan siput jantan) in 20 years. Poster presented at the Sixth National Seed Symposium, 23–24 March 2010, Putrajaya.
- 76 NASHATUL ZAIMAH, N.A., NOR ASMAH, H. & NADIAH SALMI, N. Forest tree seed testing: *Dryobalanops aromatica* and *Neobalanocarpus heimii*. Poster presented at the Sixth National Seed Symposium, 23–24 March 2010, Putrajaya.
- 77 NIK ADLIN, N.M.S., WAN TARMEZE, W.A. & KHAIRUL, M. Aplikasi konsep modular produk beranda dari kayu bakau (*Rhizophora* Spp.). Poster presented at the “Hari Inovasi NRE 2010”, 9–10 November 2010, Putrajaya.
- 78 NIK ADLIN, N.M.S., WAN TARMEZE, W.A., KHAIRUL, M., SHAMSUDDIN, I. & TENGKU AHMAD, T.A.J. Produk beranda dari kayu bakau (*Rhizophora* spp.). Poster presented at the “Seminar Pemuliharaan Hutan Persisiran Pantai Negara 2010”, 5–6 October 2010, Kota Kinabalu.
- 79 NIK ADLIN, N.M.S., WAN TARMEZE, W.A., KHAIRUL, M., SHAMSUDDIN, I. & TENGKU AHMAD, T.A.J. Verandah products from bakau wood (*Rhizophora* spp.) Poster presented at International Symposium On Forestry & Forest Products (ISFFP) 2010, 5–7 October 2010, Kuala Lumpur.
- 80 NIK ADLIN, N.M.S., WAN TARMEZE, W.A., TENGKU AHMAD, T.A.J. & KHAIRUL, M. Modular furniture design for high density wood. Poster presented at the FRIM’s Innovation Day 2010, 1 December 2010, Forest Research Institute Malaysia, Kepong.
- 81 NIK YASMIN, N.Y., SAISATUL HUSNI, S., MAILINA, J., MOHD FARIDZ, Z.P., MOHD FADZIL, A.Z., NOR AZAH, M.A. & ABD. MAJID, J. Chemical profiling of volatile oils from *Spilantes acmella* (L.) Murr. and *Citrus aurantifolia* (Christm.) swingle extracted using microwave-assisted hydrodistillation system. Poster presented at the Medicinal and Aromatic Plants Seminar, 3–4 August 2010, Forest Research Institute Malaysia, Kepong.
- 82 NOOR AZLIN, Y. & NAIMAH, C.L. Sustainable environment to prevent climate change. Poster presented at the Environmental Day, Sekolah Menengah Kebangsaan Bukit Indah, Ampang, 28 June 2010, Kuala Lumpur.
- 83 NOOR RASYILA, M.N., ZAMREE, M.S., KHAIRUL KAMILAH, K.A., HADA MASAYU, D.I., PIN, K.Y., MOHD. SHAHIDAN, M.A., MOHD HAPIZUL, U.L. & MASITAH, M.T. In process quality control of compressed uncoated *Garcinia atroviridis* tablets. Poster presented at the International Conference on Biotechnology for the Wellness Industry, 8–10 October 2010, Putra World Trade Centre, Kuala Lumpur.
- 84 NOOR SYAHEERA, M.Y., RUZI. A.R., TAN, A.L., MOHD SHAHIDAN, M.A., ZAMREE, M.S., MOHD. FAIZAL, K. & MASITAH, T. Leaf and stem anatomical characteristics of *Tinospora crispa* (L). Poster presented at the International Symposium on Forestry and Forest Products 2010, 5–7 Oktober 2010, Kuala Lumpur.
- 85 NOR ASMAH, H., NOR HASNIDA, H., NASHATUL ZAIMAH, N.A., MARZALINA, M. & KODISWARAN, I. Production of synthetic seeds of *Acacia* hybrid and *Endospermum diadenum* for conservation of elite planting materials. Poster presented at the National Biotechnology Seminar, 24–26 May 2010, Kuala Lumpur.
- 86 NOR ASMAH, H., NOR HASNIDA, H., NASHATUL ZAIMAH, N.A., NADIAH SALMI, N. & HAMILIAR, H. Synthetic seeds of timber species: an alternative for sustainable planting material for commercial plantations. Poster presented at the Malaysia Technology Expo (MTE) 2010, 4–6 February 2010, Kuala Lumpur.
- 87 NOR AZAH, M.A., ABDUL MAJID, J., MAILINA, J., SAIDATUL HUSNI, S., CHANG, Y.S., NIK YASMIN, N.Y. & MOHD, FARIDZ, Z. Analysis of gaharu oils from artificially induced *Aquilaria* species. Poster presented at the International Conference on Natural Products, 11–12 December 2010, Penang.
- 88 NOR DATIAKMA, M.A., MARZALINA, M., MASTURA, M., NORALIZA, A., HAMZAH, M.S., SYED ZAHIR IDID, S.O.I. & SAEID REZA, D.J. Plant-derived anti-multidrug resistance *Staphylococcus aureus* (MRSA) agent. Poster presented at the ITEX, 14–16 May 2010, Kuala Lumpur.
- 89 NOR DATIAKMA, M.A., NORALIZA, A., ANEE SURYANI, S., NADIAH SALMI, N., NASHATUL ZAIMAH, N.A., NOR ASMAH, H. & HAMILIA H. Proteomics techniques for assessing protein expression from *Swietenia macrophylla*. Poster presented at the Sixth National Seed Symposium; Seed: The Source of Life and Biodiversity, 23–24 March 2010, Putrajaya.
- 90 NOR DATIAKMA, M.A., NORALIZA, A., MARZALINA, M., MASTURA, M., SAIFUL AZMI, J., LING, S.K., SAEID REDZA, D.J., HAMZAH, M.S. & SYED ZAHIR IDID, S.O.I. Anti multidrug resistant *Staphylococcus aureus* (MRSA) potential of *Senna alata* L. Poster presented at the National Biotechnology Seminar: Cultivating an Innovative Economy, 24–26 May 2010, Putra World Trade Centre, Kuala Lumpur.
- 91 NORALIZA, A., ANEE SURYANI, S., NOR DATIAKMA, M.A., NADIAH SALMI, N., NASHATUL ZAIMAH, N.A., NOR ASMAH, H. & HAMILIA, H. Sample preparation protocols for analysing *Swietenia macrophylla* seed protein through SDS-PAGE. Poster presented at the Sixth National Seed Symposium, 23–24 March 2010, Putrajaya.
- 92 NORDAHLIA, A.S. & ANI, S. Comparative wood anatomy, basic density and sapwood percentage of 8- and 10-year-old sentang planted from rooted cuttings. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 93 NORDAHLIA, A.S., ANWAR, U.M.K & HAMDAN, H. Effect of Age (2-year-old and 4-year-old) and height on the properties of buluh beting (*Gigantochloa levis*). Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.

- 94 NORHAYATI, I., GETHA, K., MOHD ILHAM, A., LILI SAHIRA, H., MUHD HAFFIZ, J., SITI SYARIFAH, M.M., MUHD. SYAMIL, A. & MOHD. HAFIDZ HADI, A. Discovery of potential drug candidates for antitrypanosomal activity from Malaysian plant species. Poster presented at the International Symposium of Health Sciences (i-SIHAT 2010), 9–10 December 2010, Kuala Lumpur.
- 95 NORHAYATI, M., NOR AZAH, M.A., NORAMLY, M., ZURIATI, Z. & LILY, B.D. Volatile components from the stem of *Xylopiya magna* ex Hook.F. (Annonaceae). Poster presented at the Medicinal and Aromatic Plants Seminar, 3–4 August 2010, Forest Research Institute Malaysia, Kepong.
- 96 NORMAIZIRA, H., FADZUREENA, J., MAZURA, M.P., ILYANIE, H.Y. & ROHANA, S. Anti-inflammatory and cytotoxicity evaluation of methanol extracts of some Malaysian medicinal plants. Poster presented at the International Conference on Natural Products, 10–12 December 2010, Penang.
- 97 NORSHAKILA, Y., INTAN NURULHANI, B., LIM, H.F., HUDA FARHANA, M.M. & TARIQ MUBARAK, H. Penggunaan kawasan penanaman ru: kajian kes sebelum dan selepas penanaman di Pahang. Poster presented at the “Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2010”, 5–6 October 2010, Kota Kinabalu.
- 98 NORSHAKILA, Y., LIM, H.F. & INTAN NURULHANI, B. The extent of medicinal plant use by Semelai community in RPS. Poster presented at the Third (IIUM-iCAST 2010) International Conference on Advancement in Science and Technology, 26–29 November 2010, Kuantan.
- 99 NORULAIMAN, Y., ONG, B.K., NOR AZAH, M.A. & MOHD. IRMAN SHAH, M. Microbial load enumeration of commercially available oral form herbal products. Poster presented at the Medicinal and Aromatic Plants Seminar, 3–4 August 2010, Forest Research Institute Malaysia, Kepong.
- 100 NORULAIMAN, Y., ONG, B.K., NOR AZAH, M.A. & MOHD. IRMAN SHAH, M. Comparison between pour and spread plating technique in microbial total plate count of oral form herbal product. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 101 NORWATI, M., SITI SALWANA, H., LEE, C.T. & NURUL FARHANAH, Z. Development of genetic markers for *Aquilaria* species identification using Amplified Fragment Length Polymorphism (AFLP)—a preliminary study. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 102 NURFAZLINA, K., MOHD NIZAM, M.S. & NUR SUPARDI, M.N. Edaphic relationship among liana species at Pasoh Forest Reserve, Negeri Sembilan. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 103 NURHANAN, M.Y., HUQ, F., BEALE, P. & ANEE SURYANI, S. *In vitro* studies on synergism in combination of curcumin and platinum-based drugs against ovarian tumour models. Poster presented at the Medicinal and Aromatic Plants Seminar, 3–4 August 2010, Forest Research Institute Malaysia, Kepong.
- 104 NURNIDA, M.K. & NORAINI, T. Lamina anatomical characteristics of *Ceriops decandra* (Griff.) Ding Hou and *Ceriops tagal* (Pers.) C.B. Rob. (Rhizophoraceae). Poster presented at the International Symposium on Forest and Forest Products, 5–6 October 2010, Kuala Lumpur.
- 105 NUZIAH, H., ZAINON A.S., RASADAH, M.A. & KHATIJAH, H. Monographic identification from the stem of *Tinospora cirspa* (L.) Hook. f. & Thomson (Menispermaceae). Poster presented at the Twelfth Medicinal and Aromatic Plants Seminar, 3–4 August 2010, Forest Research Institute Malaysia, Kepong.
- 106 ONG, C.B. & TING, K.B. Evaluation of finger-jointing properties of *Acacia mangium*. Poster presented at the Seminar and Workshop on Improved Utilization of Tropical Plantation Timbers, 23–25 March 2010, Kuala Lumpur.
- 107 ONG, S.P. & CHENG, S. Serangan *Streblote lipara* (Lepidoptera: Lasiocampidae) ke atas pokok *Rhizophora apiculata* dan *R. mucronata* di Perak dan Pulau Pinang. Poster presented at the “Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2010”, 5–6 October 2010, Kota Kinabalu.
- 108 PATAHAYAH, M., MOHD FARID, A. & LEE, S.S. Kemosostan pokok api-api (*Avicennia* sp.): pemerhatian awal. Poster presented at the “Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara: Kepelbagaian Hutan Pesisiran Pantai, Warisan 1Malaysia”, 5–6 Oktober 2010, Kota Kinabalu.
- 109 PUAD, E., HASHIM, W.S., JALALI, S. & LAWRENCE, F. Super palmply—super palm plywood from oil palm trunk. Poster presented at the Malaysia Technology Expo, 4–6 February 2010, Kuala Lumpur.
- 110 PUAD, E., HASHIM, W.S., RAHIM, S., JALALI, S., CHOO, K.B. & SIM, Y.F. Engineered flooring from oil palm trunk. Poster presented at the Malaysia Technology Expo, 4–6 February 2010, Kuala Lumpur.
- 111 PUAD, E., HASHIM, W.S., RAHIM, S., JALALI, S., CHOO, K.B. & SIM, Y.F. Resin impregnated oil palm flooring. Poster presented at Malaysia Technology Expo, 4–6 February 2010, Kuala Lumpur.
- 112 PUAD, E., JAMALUDIN, A. & ROSDI, M. Panel pameran pelbagai bentuk. Poster presented at the “Hari Inovasi FRIM”, 30 November–1 December 2010, Forest Research Institute Malaysia, Kepong.
- 113 PUAD, E., TAN, W.M. & ALIEYSA, L. Environmental friendly drum method of carbonization. Poster presented at the “Festival Sains dan Inovasi Selangor”, 11–13 June 2010, Selangor.
- 114 PUAD, E., WAN ASMA, I., SHAHARUDDIN, H., MAHANIM, S. & RAFIDAH J. Rice straw pellet: potential solid fuel from agriculture residues. Poster presented at the “Hari Inovasi FRIM”, 1 December 2010, Forest Research Institute Malaysia, Kepong.
- 115 PUAD, E., WAN ASMA, I., SHAHARUDDIN, H., MAHANIM, S. & RAFIDAH, J. Maximizing utilization of rice straw for solid fuel and bioethanol production through pelletizing technology. Poster presented at the Seventh Biomass Workshop Asia, 29 November–1 December 2010, Jakarta.
- 116 PUAD, E., WAN ASMA, I., SHAHARUDDIN, H., MAHANIM, S. & RAFIDAH, J., AHMAD SHARAFI, O. & SHAMSURI, M.S. Mesin serba boleh briket arang. Poster presented at the “Hari Inovasi FRIM”, 30 November–1 December 2010, Forest Research Institute Malaysia (FRIM), Kepong.

- 117 RAFIDAH, J., KINYA, S., TOMOHISA, M., MOHD NOR, M.Y. & WAN ASMA, I. Syngas production from Malaysian oil palm trunk residue via gasification process. Poster presented at the Renewable Energy Conference, 27 June–2 July 2010, Yokohama.
- 118 RAFIDAH, J., MOHD NOR, M.Y., WAN ASMA, I., MAHANIM, S.M.A., SHAHARUDDIN, H., PUAD, E., AZMALISA, T., AHMAD SHARAFI, O., NURUL FAHIZA, A.Z. & SHAMSURI, M.S. Synthesis of dimethyl ether (DME) from woody biomass syngas via one step synthesis process over bi-functional catalyst. Poster presented at the “Hari Inovasi FRIM”, 1 December 2010, Forest Research Institute Malaysia, Kepong.
- 119 RAFIDAH, J., SAKANISHI, K., MIYAZAWA, T., MOHD NOR, M.Y., WAN ASMA, I., MAHANIM, S.M.A., SHAHARUDDIN, H. & PUAD, E. Effect of various gasifying agents and steam to carbon (S/C) ratio on syngas production of Malaysia oil palm trunk residue via gasification process. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 120 RAFIDAH, J., WAN ASMA, I., MAHANIM, S.M.A., SHAHARUDDIN, H. & PUAD, E. & NURUL FAHIZA, A.Z. Effect of thermal treatment on bioethanol production from rice straw using local enzymes via enzymatic analysis. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 121 RAFIDAH, J., WAN ASMA, I., MAHANIM, S.M.A., SHAHARUDDIN, H., PUAD, E. & NURUL FAHIZA, A.Z. Application of local enzymes extracted from selected fungi species in bioethanol production from rice straw. Poster presented at the “Hari Inovasi FRIM”, 1 December 2010, Forest Research Institute Malaysia, Kepong.
- 122 RAHIM, S., KOH, M.P., HASHIM, W.S. & YUSOUF, A.L. Utilisation of biomass for wood-based panel products in Malaysia. Poster presented at the XXIII IUFRO World Congress, 23–28 August 2010, Seoul.
- 123 ROHANA, M.A., AHMAD NAZARUDIN, M.R. & TSAN, F.Y. Phenolic compounds in some urban trees. Poster presented at the Twenty-First Malaysian Society of Plant Physiology Conference: The Role of Plant Physiology in Climate Change Adaptation and Mitigation, 13–14 December 2010, Cameron Highlands.
- 124 ROSDI, K., AB RASIP, A.G., HASHIM, M.N., ABD RAZAK, O. & AHMAD ZUHAI, Y. Planting of *Jathropa curcas* L. on BRIS area: FRIM experience. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 125 ROZITA, A., TUMIRAH, K. & WAN RASHIDAH, A.K. Predetermined heavy metal status in soil for herbal planting. Poster presented at the Twelveth Seminar on Medicinal and Aromatic Plants, 3–4 August 2010, Forest Research Institute Malaysia, Kepong.
- 126 ROZITA, A., WAN RASIDAH, K., ROSAZLIN, A. & WAN ASMA, I. Utilisation of plant residues as organic mulches to enhance the growth of *Orthosiphon stamineus* planted on five different soils. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 127 ROZITA, A., WAN RASIDAH, K., TUMIRAH, K. & MOHAMAD FAKHRI, I. Predetermined heavy metal status in soil for herbal planting. Poster presented at the Twelfth Medicinal and Aromatic Plants Seminar, 3–4 August 2010, Forest Research Institute Malaysia, Kepong.
- 128 RUSHDAN, I., LATIFAH, J. & MAHMUDIN, S. Malaysian kenaf rayon. Poster presented at the FRIM Innovation Day 2010, 30 November–1 December 2010, Forest Research Institute Malaysia, Kepong.
- 129 RUSHDAN, I., LATIFAH, J. & MAHMUDIN, S. Laboratory pulp moulding machine. Poster presented at the FRIM Innovation Day 2010, 30 November–1 December 2010, Forest Research Institute Malaysia, Kepong.
- 130 RUSHDAN, I., NURUL HUSNA, M.H., SHARMIZA, A. & SALMIAH, U. Biochemical and biomechanical pulping of oil palm empty fruit bunch and frond through solid-state fermentation with white-rot fungus *Lentinus sajor-caju*. Poster presented at the National Biotechnology Seminar 2010, 24–26 May 2010, Kuala Lumpur.
- 131 SAIDATUL HUSNI, S., NOR AZAH, M.A., MAILINA, J., NORULAIMAN, Y., ABDUL MAJID, J., NIK YASMIN, N.Y., MOHD FARIDZ, Z.P. & AHMAD ABDUL QAYYUUM, M. Preparation of microemulsion containing *Cinnamomum zeylanicum* Blume for personal care use. Poster presented at the Twelfth Medicinal and Aromatic Plants Seminar, 3–4 August 2010, Forest Research Institute Malaysia, Kepong.
- 132 SAIDATUL HUSNI, S., NOR AZAH, M.A., MAILINA, J., NORULAIMAN, Y., ABDUL MAJID, J., NIK YASMIN, N.Y., MOHD FARIDZ, Z.P. & AHMAD ABDUL QAYYUUM, M. Optimization of supercritical carbon dioxide (SC-CO<sub>2</sub>) extraction of citronellal from fruit peel of kaffir limes (*Citrus hystrix*). Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 133 SAIFUL AZMI, J., ADIANA, M.A., MASTURA, M. & FAREDAH, A. Inhibitory activity of polyhydroxyflavonones against methicillin-resistant *Staphylococcus aureus* (MRSA). Poster presented at the International Conference on Antimicrobial Research, 3–5 November 2010, Valladolid Spain.
- 134 SALBIAH, M., LING, S.K., ADILAH, H.Z.A., TAN, A.L. & ZUNOLIZA, A. Differentiation of *Melastoma malabathricum* L. from different localities using FT-IR and 2D-IR correlation spectroscopy. Poster presented at Twelveth Medicinal and Aromatic Plants Seminar, 3–4 August 2010, Forest Research Institute Malaysia, Kepong.
- 135 SAMSUL HADI, M., MUHAMAD IQRAM, I., HAMDAN, H., ANWAR, U.M.K. & ANA AZRENA, R. WPG of chemically modified *Endospermum malaccense* and *Hevea brasiliensis* with propionic anhydride. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 135 SEET, B.H., HAMDAN, H., ANWAR, U.M.K., AIDA MARYANI, C.M.N. & ANA AZRENA, R. Chemical modification of rubberwood with acetic anhydride. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 136 SHAHARUDDIN, H., WAN ASMA, I., RAFIDAH, J., PUAD, E. & MAHANIM, S.M.A. Bintangor laut (*Calophyllum Inophyllum* L.) oil: a potential source of biodiesel (biofuel). Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.

- 137 SHARMILLAH, S., AZYYATI, A.K. & NOOR AZLIN, Y. Highlights of the outcome of the Workshop on Integration of Environmental Education for Outdoor Learning in Forest Research Institute Malaysia (FRIM). Poster presented at the AKAA & Edu4PAAZAB Symposium 2010: Linking Zookeepers and Educators to Biodiversity, 15–18 February 2010, Pretoria.
- 138 SIK, H.S., CHOO, K.T., SARANI, Z. & SHARIM, A. Drying profiles of rubberwood at high temperature. Poster presented at the XXIII IUFRO World Congress, 23–28 August 2010, Seoul.
- 139 SITI HUMEIRAH, A.G., NOR AZAH, M.A. & MAILINA, J. Essential oils constituents from seven *Xylopi*a species and their potential as personal care products. Poster presented at the Pasoh International Symposium (Celebrating 25 Years of Lowland Tropical Forest Research, 10–11 November 2010, Forest Research Institute Malaysia, Kepong.
- 140 SITI SALWANA, H., NORWATI, M. & LEE, C.T. Evaluation of genetic relatedness between *Aquilaria* species using allozyme analysis. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 141 SYAHIDA EMIZA, S., STAPLES, G., HARON, N.W. & KIEW, R. A study on trichomes structure of *Erycibe* (Convolvulaceae) in Peninsular Malaysia. Poster presented at the Nineteenth Scientific Conference of the Electron Microscopy Society of Malaysia (EMSM), 14–16 December 2010, Langkawi.
- 142 TAN, A.L., CHANG, Y.S. & LING, S.K. Observations on the morphological variations of *Melastoma* spp. in Peninsular Malaysia. Poster presented at the Eighth International Flora Malesiana Symposium, 23–27 August 2010, Singapore Botanic Gardens, Singapore.
- 143 TAN, S.A. Forest parameters extraction using terrestrial laser scanner. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 144 TANG, L.K. & ANG, L.H. Effects of soil treatments on vegetative growth of pineapple (*Ananas comosus*) var. sugarloaf grown on sand tailings. Poster presented at the Seventh International Pineapple Symposium, 13–15 July, 2010, Persada Johor Bahru.
- 145 TANG, L.K. & ANG, L.H. Accuracy of biomass estimation using Brown's allometric equation for projection of above ground carbon sequestration potential of broadleaf plantation species grown on an ex-tin mine. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur
- 146 TANG, L.K. & ANG, L.H. Regeneration composition and distribution at open and greened sites of a 20-hectare ex-tin mine in Peninsular Malaysia. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 147 TARIQ MUBARAK, H., MOHD AFENDI, H., MARZALINA, M. & AZHARIZAN, M.N. Perbandingan antara teknik penyemaian biji benih dan kutipan anak liar bagi menghasilkan keperluan bahan tanaman nyireh bunga (*Xylocarpus granatum*). Poster presented at the "Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2010: Kepelbagaian Hutan Pesisiran Pantai, Warisan 1Malaysia", 5–6 October 2010, Kota Kinabalu.
- 148 THI, B.K. & LEE, S.S. Molecular phylogeny of *Lignosus* spp. (tiger's milk fungus): implications for taxonomy and utilization. Poster presented at the XXIII IUFRO World Congress 2010, 23–28 August 2010, Seoul.
- 149 WAN TARMEZE, W.A. & MARZALINA, M. MYScrim-OPT. Poster presented at MTC Global Woodmart 2010, 19–20 October 2010, Kuala Lumpur.
- 150 WAN TARMEZE, W.A., MARZALINA, M., LIN, K.H. & MOHD SOPIAN, M. Decorative lumber—a product from waste to wealth. Invention and poster presented at the MTE 2010, 4–6 February 2010, Kuala Lumpur.
- 151 WAN TARMEZE, W.A., MARZALINA, M., MOHD. RIDZUAN, M. & MOHD. SOPIAN, M. OPTScrimber™ for furniture and interior products. Invention and poster presented at the Twenty-First International Invention, Innovation and Technology Exhibition (ITEX 2010), 14–16 May 2010, Kuala Lumpur.
- 152 WAN TARMEZE, W.A., NIK ADLIN, N.M.S., KHAIRUL, A. & AZRINA, Y. EROSSE-‘Entertainment-Ready’ outdoor seatings with built-in sound system and electric outlets. Poster presented at the "Hari Inovasi FRIM 2010", 1 December 2010, Forest Research Institute Malaysia, Kepong.
- 153 WAN TARMEZE, W.A., NIK ADLIN, N.M.S. & KHAIRUL, M. Kajian gaya kemasan produk kayu bakau (*Rhizophora* spp.). Poster presented at the "Seminar Kebangsaan Pemuliharaan Hutan Pesisiran Pantai Negara 2010", 5–6 October 2010, Kota Kinabalu.
- 154 WAN TARMEZE, W.A., NIK ADLIN, N.M.S., KHAIRUL, M. & LOH, S.H. Study on finishing of products from bakau wood (*Rhizophora* spp.). Poster presented at the International Symposium on Forestry and Forest Product 2010, 5–7 October 2010, Kuala Lumpur.
- 155 YANTI, A.K., ABDUL HAMID, S., HAMDAN, H., SAID, A., RAZALI, A.K. & AZRENA, A.K. Physical and mechanical properties of cocosplywood. Poster presented at the International Symposium on Forestry and Forest Products, 5–7 October 2010, Kuala Lumpur.
- 156 YAP, J.W., CLYDE, M.M., KANDASAMY, K.I., MADON, M. & KOUTOULIS, A. Estimation of genome size for identification of the F1 *Acacia* hybrids (*Acacia mangium* x *Acacia auriculiformis*). Poster presented at the IUFRO Kuala Lumpur 2010 Conference, 7–12 March, Kuala Lumpur.
- 157 YAP, J.W., CLYDE, M.M., KANDASAMY, K.I., MADON, M. & KOUTOULIS, A. *In vitro* polyploid induction in *Acacia*: towards the development of seedless triploid trees. Poster presented at the International Conference "Green Plant Breeding Technologies", 2–5 February 2010, Vienna.
- 158 YAZAWA, Y., KOHYAMA, T., KUBO, T., ABD RAHMAN, K., POORTER, L., STERCK, F. & POTTS, M.D. Relationship between tree architecture and demographic traits among 200 co-occurring rainforest tree species in Peninsular Malaysia. Poster presented at the International Meeting of the Association for Tropical Biology and Conservation, 22 July 2010, Bali.

- 159 YAZAWA, Y., KOHYAMA, T., KUBO, T., ABD RAHMAN, K., POORTER, L., STERCK, F. & POTTS, M.D. Wood density drives architectural differentiation amongst 108 species in a lowland rainforest tree community. Poster presented at the British Ecological Society, Annual Meeting, 7 September 2010, Leeds.
- 160 ZARIDAH, M.Z., NOR AZAH, M.A., ABDUL MAJID, J., MOHD FARIDZ, Z., NIK YASMIN, N.Y. & ROHANI, A. Repellency activity of essential oil from mosquito plant, *Pelargonium citrosum* and their major compounds. Poster presented at the Forty-Sixth Annual Seminar of Malaysian Society of Parasitology and Tropical Medicine, 24–25 March 2010, Kuala Lumpur.
- 161 ZUNOLIZA, A., ZHARI, I. & RASADAH, M.A. Angiotensin-converting enzyme (ACE) inhibitor from *Ficus deltoidea* Jack for hypertension. Poster presented at the International Conference on Natural Products, 10–12 December 2010, Penang.
- 162 ZUNOLIZA, A., ZHARI, I. & RASADAH, M.A. Stability studies on the leaf extracts of *Ficus deltoidea* (Jack). Poster presented at the International Conference on Natural Products, 10–12 December 2010, Penang.

## TESIS/THESIS

- 1 CHAN, H.T. Diversity of Boleteceae in Peninsular Malaysia. M.Sc. Thesis, University of Malaya, Kuala Lumpur.
- 2 JOANN, C.L. Insectivorous bat assemblages in relation to spatial aspects of Virgin Jungle Reserves (VJR) in Peninsular Malaysia. M.Sc. thesis, University Malaya, Kuala Lumpur.
- 3 KHAIRUL, A. Properties and characterization of *Acacia* wood modified using propionic and succinic anhydride. Ph.D. thesis, Universiti Sains Malaysia, Penang.
- 4 MOHD FARID, A. Disease survey, identification and pathogenicity of root fungi in forest plantations of Peninsular Malaysia. Ph.D. thesis, Universiti Sains Malaysia, Penang.
- 5 MOHD PARID, M. Visitors' perceptions and economic valuation of Pulau Redang Marine Park (PRMP) recreational resources. M.Sc. thesis. Universiti Putra Malaysia, Serdang.
- 6 MOHD TAMIZI, M. Fundamental and characteristic study of cultivated Malaysian bamboo—Selective genus *Gigantochloa*. Ph.D. thesis, Universiti Sains Malaysia, Penang.
- 7 MOHD ZHARIF, A.T. Characterisation of kenaf bast fibre filled poly (butylene succinate) composites: mechanical, water absorption and weathering properties. M.Sc. thesis, Universiti Sains Malaysia, Penang.
- 8 MUHAMMAD SYAMIL, A. Synthesis of methoxylated and hydroxylated flavonoids. M.Sc. thesis, Universiti Teknologi Malaysia, Skudai.
- 9 NOOR AZRIEDA, A.R. Screening of six selected pioneer forest species for compatibility with Portland cement and properties of the cement boards. M.Sc. thesis, Universiti Teknologi MARA, Shah Alam, Malaysia.
- 10 NOOR HAZMIRA, M. Forecasting availability and consumption of rubberwood in Peninsular Malaysia. M.Sc. thesis. Universiti Putra Malaysia, Serdang.
- 11 NOR DATIAKMA, M.A. The antibacterial effects of selected medicinal plant extract against multi-drug resistant *Staphylococcus aureus* (MRSA) using 2-Dimensional Electrophoresis (2-DE). M.Sc. thesis, International Islamic University Malaysia, Gombak.
- 12 NURHANAN MURNI, Y. Synergism from combination between platinum and phytochemicals in ovarian cancer cell lines. Ph.D. thesis, University of Sydney, Australia.
- 13 RAFEADAH, R. Interfacial micromechanics of natural cellulose whiskers polymer nanocomposites using Raman spectroscopy. Ph.D. thesis, The University of Manchester, United Kingdom.
- 14 ROSHAN JAHN, M.S. Optimization of extraction of *Centella asiatica* and *Erythroxylum cuneatum* and their evaluation as a neuroprotective agent. M.Sc. thesis, International Islamic University Malaysia, Gombak.
- 15 SIK, H.S. Kajian sifat fizikal dan mekanik kayu getah yang diproses menggunakan rawatan pengeringan suhu tinggi. Ph.D. thesis, Universiti Kebangsaan Malaysia, Bangi.
- 16 ZUNOLIZA, A. Phytochemical, biological, stability and pharmacokinetic studies on the extract of three varieties of *Ficus deltoidea* Jack Leaves, PhD?MSc? University??

## E-PENERBITAN/E-PUBLICATIONS

- 1 ABDUL KHALIL, H.P.S., KHAIRUL, A., BAKARE, I.O., IRSHAD UL HAQ BHAT. Thermal, spectroscopic and flexural properties of anhydride modified cultivated *Acacia* spp. *Wood Science Technology* doi: 10.1007/s00226-010-0365-z.
- 2 AHMAD FAUZI, P., ROHANA, A.R., ISMARIAH, A., LIM, H.F. & RODA, J.M., Rubberwood timber decreasing, with the wooden furniture industry? EAS Strategic Options. Online at [www.frim.gov.my/pdf/EAS%20Strategic%20Options%20No5.pdf](http://www.frim.gov.my/pdf/EAS%20Strategic%20Options%20No5.pdf).
- 3 KHALID, H.M., AMINAH, A., KHAIIRIAH, J. & VIMALA, S. Antioxidant activity of pink-flesh guava (*Psidium guajava* L.): effect of extraction techniques and solvents. *Food Analytical Methods*. doi: 10.1007/s12161-010-9139-3.

- 4 JEYANNY, V., SYED OMAR, S.R., AZMI, M. & JURAIMI, A.S. Preliminary assessment of the effect of waterseeding technique and herbicide application on weedy rice tillers. International Rice Research Notes (0117-4185) Available online at [http://beta.irri.org/publications/images/stories/irrn/IRRN2009/CropMgt\\_SR%23671.pdf](http://beta.irri.org/publications/images/stories/irrn/IRRN2009/CropMgt_SR%23671.pdf). Verified on 4 January 2010.
- 5 LOH, Y.F., PARIDAH, M.T., HOONG, Y.B., BAKAR, E.S., ANIS, M. & HAMDAN, H. Resistance of phenolic-treated oil palm stem plywood against subterranean termites and white rot decay. Online at <http://www.elsevier.com/locate/ibiod> doi:10.1016/j.ibiod.2010.05.011.
- 6 NIK MUSAADAH, M., TARR, J.M., KOHNER, E.M. & CHIBBER, R. NADPH oxidase versus mitochondria-derived ROS in glucose-induced apoptosis of pericytes in early diabetic retinopathy. *Journal of Ophthalmology*. Vol. 2010, Article ID 746978, 10 pages, 2020. doi: 10.1155/2010/746978.
- 7 RODA, J.M., AHMAD FAUZI, P., ROHANA, A.R., LIM, H.F., ISMARIAH, A. & NOOR AINI, Z. REDD for Malaysia. EAS Strategic Options No. 4. Online at [www.frim.gov.my/pdf/EAS%20Strategic%20Options%20No4.pdf](http://www.frim.gov.my/pdf/EAS%20Strategic%20Options%20No4.pdf).
- 8 VINCENT, J.R., ISMARIAH, A., KURT, A.S., EMILY, W., RODZIAH, H., MARRYANNA, L. & JIE-SHENG, T.S. Measuring tropical forests' impacts on watershed services: spatial variation in quantity and costs in Theme 3.6 :Valuation Of Environmental Services And Benefit Sharing. XIII World Forestry Congress. Buenos Aires, Argentina, 18-23 October 2009. pp 1-28 [http://www.cfm2009.org/es/programapost/trabajos/Measuring\\_tropical\\_forests\\_FD.pdf](http://www.cfm2009.org/es/programapost/trabajos/Measuring_tropical_forests_FD.pdf).
- 9 ZAIHAN, J., HILL, C.A.S., HASHIM, W.S., HAMDAN, H. & XIE, Y. Analysis of water vapour sorption of oleo-thermal modified wood of *Acacia mangium* and *Endorspermum malaccense* sp. by a parallel exponential kinetics model and according to the Hailwood-Horrobin model. *Holzforschung* doi: 10.1515/HF. 2010.100.16/j.ibiod.2010.05.011.



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