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FRIM IN FOCUS

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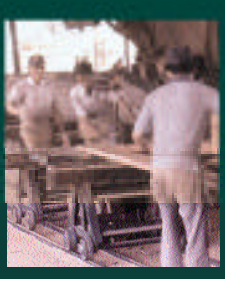
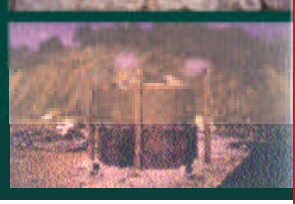
This issue's focus

Ways With Wood & Oil Palm: A Many-Splendoured Thing

On Wood & Waste Utilization

- Pulp & Paper Production • A 'Waste-ful' Of Energy
- Pumping Up Biomass Fuel Use • Grasping Glulam
- Trustworthy Trusses • Wood Composites
- Scientist In Focus • Furniture Industry
- Furniture Testing • Latex To Malaysian Oak
- Timber Verification Services • Timber Engineering





Pulp And Paper Industry

Tree-Free Paper: We'll Show You The Money

There's money to be made, forests to save, waste to use and self-sufficiency to be attained. That's pulp and paper production from oil palm empty fruit bunches, for you

IT WAS a long and bone-racking road to FuZhou in China's Fujian province, but the motley group of Malaysian civil servants, researchers and businessmen weren't deterred from what they had sought to find out.

A week later, after renting out a pulp and paper mill as old as the hills in China's rural outback, and using the precious waste they brought with them from home, they survived to announce the happy news: the pulp and paper sector in this country has the potential of being one of the most lucrative industries of the future.

World demand for paper and paperboard is expected to increase 3.1% annually, with the Asia-Pacific region forecasted to be the biggest consumer by 2013, concomitant with the region's fast-growing living standards and literacy levels, and industrial and agricultural growth.[1]

This is notwithstanding the prophesized paperless society: local paper use is expected to double over the next

More on page 3

From The Editor

WE'RE going downstream this time round, taking a look at what our Wood Chemistry and Forest Products Technology researchers are up to.

They provide the R&D back-up for our 1,000 sawmills, 99 plywood/veneer mills, 96 moulding factories, seven particleboards mills, nine medium-density fibreboard mills[1] and 2,000-odd furniture industries[2].

And hopefully, the 405 palm oil[1] and 18 paper mills[3], plus our one-and-only pulp and paper mill[3] will one day feature significantly in the picture too: our pulp and paper men continue to get media attention with a seminar they held in September.

The wood energy folks share the limelight with the conclusion of a green gabfest, the UN-sponsored World Summit On Sustainable Development, also in September.

Not to forget wood composites research, another staple of wood chemistry work, speaking of which, in this issue we highlight a disproportionate number of scientists in foci.

Perhaps because chemistry and engineering are such practical, formulaic sciences sans grand, but vague, jargon-infused concepts. And perhaps also because reducing forestry wastage and increasing processing efficiency go a long way towards ameliorating timber shortage.

When the going gets tough, timber-wise, trust our trusses to come clean. Stumped? Turn to page…for clarity and then to page…on timber construction's environmental impact that surfaced at the 7th World Conference On Timber Engineering in Shah Alam in August.

Breathlessly, another year is drawing inexorably to a close. We wish our Muslim friends, *Salam Aidil Fitri* and our Christian readers, A Blessed Christmas. Have a Meaningful New Year. FIF

[1] *Wood Chemistry Technical Advisory Panel Sessions, July 2002*
[2] *Dr H.Norini from FRIM's Techno-Economics Division*
[3] *Malaysia Pulp And Paper Manufacturers Association President Datuk Yahaya Yeop Isha*

Collaborations

Soaking Up Erosion

An MOA exploits yet another use for the versatile oil palm

MULCH mats to control soil erosion in plantations and landscaped gardens will be manufactured from oil palm fibres under a MOAagreement signed recently with a local company.

FRIM will supervise the setting up of a plant in Segamat to make the fibremats by fleece stitching and needle-punching machines, after the extraction of the fibres from the empty fruit bunches (EFBs) of the oil palm.

Studies have shown that mulch mats can provide good protection during heavy rain to young sentang and teak trees planted on slopes. The mats, once moist, mould naturally to the land surface, including hilly and rocky terrain, providing added protection. This translates into reduced costs as no extra workers are needed to secure the mats down, as in the case of plastic covers.

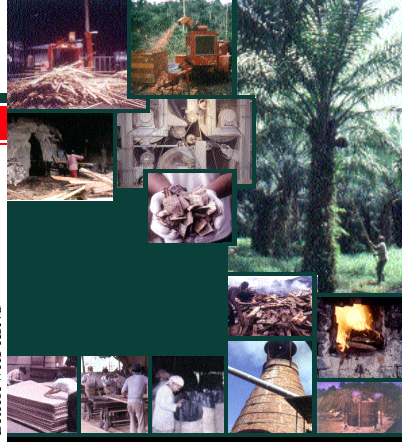
Besides erosion control, mulch mats reduce weed growth, inhibit pests like beetles and promote plant growth with better moisture retention, proper drainage and sustained nutrient supply as the mats decompose.

It is anticipated that the RM1.2 million project will be able to develop and produce locally developed geotextiles (the generic term for soil erosion control fibremats) for the local and international market. FIF

Information obtained from Wan Asma Ibrahim (asma@frim.gov.my)

ERRATA

MALAYSIAN Forestry Research And Development Board chairman Datuk Seri Lim Chong Keat had his name misspelt in our last issue (page 5). We apologize for the error.



DR HOI WHY KONG

Cover photo: Composite picture of downstream activities and products in the wood and waste utilization industry

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From cover page

Tree-Free Paper: We'll Show You The Money

decade because our volume of communications is forecasted to skyrocket by 600% over the same period, and will compensate for the electronic media's eating into paper's share of communications.[2]

The Government, in fact, has zeroed in on paper and paper products as priority areas for investment in the Second Industrial Master Plan (1996-2005) which targets a production of three million tons per year.[3]

A reality check: this is well below the 975 thousand tons we produced in 1999.[3] Our pulp, paper and paper products industry has in fact hardly grown to the extent that we have to import RM2.9 billion worth of pulp and paper products annually.[1]

The constraints for our pulp and paper industry are said to be the lack of huge tracts of forests (except for East Malaysia) and exorbitant capital investments. A conventional pulp mill of 500,000 tonnes capacity from softwood/hardwood trees would require pumping in more than US1 billion, and forests in excess of 200,000 ha.[1]

"But we need not go big and investment need not be massive," said Primary Industries Minister Datuk Seri Dr Lim Keng Yaik, the man who headed the delegation, that included FRIM researchers, to China.

Isn't the honourable Minister aware of the facts? Indeed, he is. He's talking about that precious waste they brought with them to China: empty fruit bunches (EFBs) from the oil palm.

"The Chinese experience has shown that, using the chemical pulping process for a 20,000 to 25,000 tonne per year capacity with an investment of RM1 million per 1,000 tonnes of pulp, an internal rate of return of some 30% is possible," said the Minister in his opening speech that launched a pulp and paper seminar in September. And all this on just a six-hectare piece of land.[4]

So small can be splendid, and green paper is not only technically viable, but financially attractive. Our Minister continues to reel off the figures: we had 3.5 million ha of oil palm land last year. And 405 mills producing 17.44 million tonnes of EFB that can produce two million tonnes of pulp or 1.7 million tonnes of paper per year. At the current market pulp price of some US$400 per tonne, the pulp value would be US$800 million, while the paper value at US$750 per tonne would be some US$1.27 billion.

Going green also means reduced costs from US$120 to US$150 per tonne of pulp, (or RM1, 082 per tonne of paper) as compared to the conventional costs of US$200 to US$300 per tonne of pulp.[1]

This is because EFBs are readily available all year-round, are renewable, abundant, and cheap (if not free). Also by synergizing with palm oil mills, pulp and paper mills can use the excess electricity and steam generated by the palm oil mills from burning (what else?) EFBs as renewable energy, thus eliminating energy costs.[4]

Ditto for excess treated water supply from the palm oil mills that can be recycled into the pulp and paper mills, with less water and minimal water wastage thereby achieved.[4]

As for pollution concerns, the caustic recovery in the chemical pulping method of papermaking (caustic soda is used to dissolve the lignin in the fibres), the absence of sulphide gas discharges and oil (black liquor) and suspended fibre particle removal from wastewater, sees to it that these are minimized.[4] (While new pulping and bleaching technologies are now available for such cleaner processing technology, these have been somewhat stymied by powerful timber lobbies.)[5]

And not just the big boys will get the money, but smallholders in the oil palm plantation sector hopefully, would benefit too as oil palm residues for the pulp and paper industries now have monetary, instead of nuisance, value and constitute added sources of income.

By using EFBs for pulp making, we are wasting not waste: palm oil constitutes a mere 10% of the total biomass of the plant, but the remaining cellulosic materials of trunks, fronds and EFBs are suitable papermaking stuff, among others. The Chinese and Indians have long gone into non-wood pulp making from rice and wheat straw, corn stalk, bamboo and others.

Our paper mills (with the exception of the sole pulp and paper mill in Sabah), all use recycled waste paper ('secondary fibres') which, while preserving the environment, is inferior to wood pulp. But if such waste paper is to be blended with non-wood pulp from EFBs, quality and strength can be improved greatly.[4]

EFB paper can be used for envelopes, exercise book covers, wrapping paper, fast food wrapping and shopping bags, and with the embedding of cotton and nylon threads or a little long-fibre pulp, in the paper web, such paper can also be used for cement and fertiliser bags, carton boxes and base paper for composite paper manufacture.[4]

DR HOI WHY KONG

On a roll... EFB paper is not only technically feasible, but financially attractive

Who knows, we might be able to do some transfer of technology of our own someday – neighbouring countries like Vietnam have non-wood plants that could become cash crops – and we might be able to tell them a thing or two about non-wood fibre for pulping and papermaking.[5] To date four local companies have indicated interest in setting up pulp and paper mills in various parts of the country using EFBs.[6] FIF

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[1] *Primary Industries Minister Datuk Seri Dr Lim Keng Yaik in his opening speech at the Pulp And Paper Seminar 2002 in Putrajaya in September*

[2] *The New Straits Times, 27 September*

[3] *From the paper, The Economics Of The Pulp And Paper Industry In Malaysia by Dr H.Norini (norini@frim.gov.my) presented at the Pulp And Paper Seminar, 2002*

[4] *From the paper, The Economic Viability Of Producing Pulp And Paper From EFB In Malaysia by Dr Hoi Why Kong (hoiwk@frim.gov.my) at the Pulp And Paper Seminar 2002*

[5] *The Malaysia Pulp And Paper Manufacturers Association President Datuk Yahaya Yeop Ishak*

[6] *Dr Hoi Why Kong*

Wood / Oil Palm Waste Utilization

He's Got Chemistry

Dr Hoi Why Kong, who has a degree in chemical engineering, has attracted much attention as FRIM's prolific inventor and holder of a host of awards and patents

HIS is a hard act to follow. Fourteen patents and a similar number of local and international awards in his 20 years at FRIM, and Dr Hoi Why Kong is still going strong.

Two Geneva Gold Awards, won in 1994 and 1995, the Toray Science 1994 Award, the 1991 and 1992 Petronas Inventors Awards, the Mindex Inventors Gold Award in 1994 and the Malaysian National Science And Inventors Award in 1993, constitute some of his past feats.

His award-winning research included the gasification of biomass residues for the production of energy, the generation of energy from wood wastes by the Cogen process, developing the technology for the production of fibres from oil palm residues by fractionation, the manufacture of medium-density fibreboards from oil palm empty fruit bunches (EFBs), the use of sawdust for the production of high quality briquettes, and the manufacture of activated carbon from palm kernel shells by the steam activation process.

Converting wood waste into gas for energy (gasification) was the subject of his doctorate at the University of Aston in the United Kingdom, a pertinent field at that time of the 1976-77 energy crisis. Dr Hoi improved on the gasification process using what he termed as the soap bubble analogy, and in the process, reduced costs as well.

In this method, instead of burning wood to produce carbon dioxide directly, air supply is limited during combustion to produce carbon monoxide, a higher calorific value and thus higher energy-content, gas. This is recycled back into the system as fuel.

Electricity from biomass energy is ideal to fuel small-scale food industries like the *ikan bilis* business, and noodle- and biscuit-making.

Dr Hoi's retort system in palm kernel shell carbonisation recycled smoke emissions as fuel, while his 'beehive' charcoal production technology to reduce unnecessary burning and harmful emissions, was undertaken in the days when this fuel was important for the iron and steel industry.

Burning sawdust is very smoky, but by condensing it into briquettes, it becomes useful solid fuel, while activated carbon is used to absorb foul smells.

His oil palm fractionator breaks up EFBs so that they can be burnt for energy production, be made into compost by usual composting techniques and microbes inoculation, or the multi-purpose mulching mats (see 'Soaking Up Erosion' on page 2). EFBs are also useful for making fibreboards and paper (see 'Leftovers Put To Wood Use' on page 11 and cover story, 'Tree-Free Paper: We'll Show You The Money').

Now the man with the feverish pace of thinking is putting his mind into such current concerns as the development of new products from wood wastes such as high quality liquid fuel ('gasohol', a combination of alcohol and gas) by abalative pyrolysis (a form of fermentation).

He's also working on improving the efficiency of combustion technology for the wood-based industry (an incinerator that uses the thermal oxidation process to burn municipal solid waste with minimal discharge and emissions). For more on waste fuel, see 'Warming Up To Green Fuel' and accompanying stories on pages 6 & 7.

No time to waste... Dr Hoi's outstanding 'waste research' just keeps growing

Then there's clean technology from waste discharge of the pulp and paper industry, new products from oil palm-based residues and fibres such as specialty paper, scrimber boards, animal feed, fine chemicals and advance sugars.

Dr Hoi has come up with a 'palm-eater', an equipment he jointly developed in collaboration with a private firm, that instantly pulverizes previously difficult-to-extract oil palm fronds for various uses – like paper and oil palm timber (the quality of which FRIM is working to improve upon). And there's always new and better panel products from wood waste to be worked at.

Caught your breath yet? Wait, hold on, there's more. For those of us forced to drive and contribute to the problem of a planet toasting in an atmospheric oven of noxious, heat-hugging fumes, Dr Hoi's involvement in fuel cell research should be good news.

Fuel cell studies is more than five decades old, but Dr Hoi's take on things is: just five more years for that breakthrough and we can hope to see the dawn of a dream-come-true, exhaust-free world. Asthmatics of the world, rejoice? Just imagine: fuel your car with water, and the only emission you get is water vapour which is recycled back as fuel.

Sounds simple, so why so difficult Dr Hoi? "Capital investment in the electrolysis process (used to break up water into hydrogen and oxygen which is then burnt to produce energy) is still an expensive exercise. There is also the issue of what makes for the best electrodes and getting pure water. The safety aspect also needs looking into – storing all those inflammable gases," explains Dr Hoi.

As Business Affairs Director for the newly set up FRIM Business Centre, he finds his job as business hunter for FRIM research quite fulfilling.

"One can get a little narrow-minded confined to just one's specialty and interacting only within the FRIM fraternity," says Dr Hoi. "A more complete man" is how he describes

himself now with the increasing ability to see "the big picture and beyond" in every issue.

He enjoys mentoring younger people, be they FRIM staff particularly those at the Wood Chemistry Division which he formerly headed, or varsity students whom he is supervising for their post-graduate studies.

Most stimulating of all, however, are his meetings with industry folk. "Some of the brightest sparks are clients. They come for advice and ideas. But I learn a lot from them too. We pick each other's brains." And the result of that brain-picking, many a time, has been improvements in products and technologies…and more patents.

Patents. They can be prickly subjects. "People imitate and get away with it with minor modifications," he says, but adds cheerfully, "If you can't beat them, always keep one step ahead."

And so, no sooner has he completed one project, he has already thought of a way to improve his idea. No mean feat even for a man with inventions always brewing in the backburner of his mind.

The man with the knack for coming up with Third World solutions for Third World problems was recently off to China to promote FRIM's pulp and paper production and associated technologies, as well as the general utilization of oil palm fibres.

This includes FRIM's bio-mulching mats (see also 'Soaking Up Erosion'on page 2) to halt the desertification of China's Gobi Desert in preparation for the 2008 Olympics. Yes, you guessed it. Dr Hoi had a hand in this too. FIF

DR HOI WHY KONG

Beehive charcoal production in progress

Advice From A *Sifu* Scientist

WE can praise ourselves all we like. But the litmus test of our credibility and reputation as a research body is what our clients in industry and other sectors of society think of us.

We cannot depend on the legacy of past achievements, the charisma of former research heroes. So says Dr Hoi Why Kong, FRIM's Director of Business Affairs at FRIM Business Centre.

"Soon or later we will be found out if we are not pulling our own weight in research," he says, adding that there needs to be more science in our research that goes beyond anecdotal observation to rigorous analysis.

Self-motivated, team players who are able to use the synergies of various skills and qualities of their colleagues, are ideal, but they should not degenerate into "cut and paste" scientists who ride on the successes of others. While publishing substantially is not necessarily an indication of quality, those who read, write and publish widely are usually the better crop of researchers.

Good researchers are also generous in sharing their knowledge, not esteeming themselves indispensable, but eager to mentor younger peers to achieve far more than what they (the senior officers) have accomplished. To be studiously avoided are cliquish, gossipy scientists.

Preachy obvious? But we can have short memories, and it's good to be reminded. FIF

Biomass Energy

Warming Up To Green Fuel

Getting all fired up about biomass traditionally seen as "primitive, dirty fuel" takes some stoking for many. But steps for renewable, cheaper, greener, abundant and locally available oil palm and wood residues, municipal solid waste and rice husk to compete with fossil fuels must be accelerated

A SUBJECT much-debated-to-death. Renewable energy for our health and environment's sakes, that is.

But there are other reasons why we should consider biomass as an increasingly bigger share of our energy source.

(The other renewables being still-expensive solar power, yet-to-be-finalized fuel cells and geothermal power from underground heat sources, a possibility in Sabah. Wind power has to be discounted because of our low wind speeds. Apart from its deleterious impacts on the environment, strictly speaking, hydro power cannot be considered sustainable because the energy generated by the kinetic process cannot be recovered.[1])

Consider the fact that smaller biomass micropower plants mean more local investment in power generation can be made possible.

DR HOI WHY KONG

Power optimization... A cogeneration plant in Sarawak using wood waste

It is often argued that linking smaller plants to the national grid incurs additional costs, but decentralised generation mean reduction in transmissions losses to the network, and outright cost reductions in some cases, particularly in the transmission system.

Domestic fuels also mean foreign exchange savings and additional employment (in the collection, treatment and handling of biomass, as well as the setting up, operation and maintenance of biomass power plants).

So why is it that we import coal and export biomass (charcoal and briquettes to Korea, Japan and Thailand)? It's because we still make a net gain from the foreign exchange earned to buy cheaper coal.

Gas-, oil- and coal-fired power plants, with much bigger capacities (from 200 MW to more than a 1,000 MW) as compared to biomass-fueled plants (between five to 10 MW), can also meet the country's energy needs faster.

Biomass power plants cannot go big at present because economically-viable large-scale energy production equipment are still in the experimental stage, while much of the established power machinery is subsidised.

Biomass from wood residues and municipal solid waste further have lower calorific values than fossil fuels. Oil and gas chalk up a high of between 43 to 60 MJ per kg, with calorific values of 30 MJ and 18 MJ for coal and charcoal respectively. However, oil palm residues, which form 80% of our biomass energy, are comparable to oil. At present, this energy is used to only run our palm oil mills and the needs of their workers.

Bulkier biomass, as compared to compact coal, oil and gas, also pose problems of transportion and storage which add to the costs.

Burning biomass might be more health- and climate-friendly than their fossil fuel cousins: it returns to the atmosphere the carbon dioxide that was absorbed during photosynthesis instead of adding the carbon that was previously underground, while the poisonous emissions of sulphur are absent.

However, present biomass-based fuel technologies are still mostly inefficient and polluting. (This is what Dr Hoi Why Kong and his team at FRIM are seeking to redress. See 'He's Got Chemistry'on page 4).

So, even though the Eight Malaysian Plan specifies an energy production allocation of 5% from biomass by 2005[2], or 130 PJ which is the total technical potential of biomass in the country, energy planners are not exactly exuberant in factoring it in.

Our fuel mix continues to emphasize oil, gas and coal, with the Government now favouring gas in lieu of our depleting oil reserves (we are expected to be a net importer of oil by the end of this decade). A projected five-fold jump in the use of coal (using clean-coal technology) for electric power generation in the peninsular is expected, and hydro power is being promoted for East Malaysia. FIF

Information obtained from Dr Hoi Why Kong (hoiwk@frim.gov.my), Dr Koh Mok Poh (kohmp@frim.gov.my) and their paper, Renewable Energy In Malaysia: A Policy Analysis

[1] *Dr Hoi Why Kong*

[2] *Current global primary energy from renewable energy (RE) is 2%, but the recent UN Earth Summit in Johannesburg has failed to come up with a target for increasing RE use. RE use has, in fact, decreased in countries like the UK, from 2.8% to 2.6%, last year, although the British government espouses a 10% RE use by 2010 as a policy*

RE Incentives

Pumping Up Biomass Fuel Use

POLICY intervention to level the playing field so that renewable energy (RE) sources are financially competitive with traditional fossil fuels – this is key to achieving our sustainable energy targets.

There should be no penalties on RE in the form of import duties on equipment, and the RM2 million BTU (British Thermal Unit) subsidy on natural gas ought to be lifted to undo market distortion in fuel prices, in line with phasing out energy subsidies for fossil fuels.

The economies of scale and short payback periods are still beyond the reach of biomass-based fuel technologies. But loans for RE projects are hard to come by, with weak or non-existence credit histories rendering credit analysis almost impossible.

This is compounded by the fact that most of our RE projects are palm oil-associated using traditional turnkey contracts. These involve the equipment suppliers directly, leading to over-specification and reduced project viability.

RE investors should be able to avail themselves of a revolving green fund on attractive terms and conditions. A credit guarantee scheme should be set up to cover loans given by banks and financial institutions at reduced rates and extended loan periods up to the life of the projects.

Also to be in place is the legislative provision for grid connection of biomass plants as part of a new independent grid system operator (IGSO).

Such a provision must be based on these premises: that 1) RE plants have the right to sell power to the grid on transparent terms, 2) fixed price-setting mechanisms are accorded to RE grid-connected plants and 3), RE electricity sales must be regulated by the Energy Commission and implemented through the IGSO framework.

Superior RE technologies need to be promoted, and ways to economically compact biomass and dry it for storage needs to be looked into.

However, research-based RE projects are not generally aimed at commercialisation, and there needs to be adequate coordination among the RE fraternity to take advantage of the knowledge gained from these studies.

RE was institutionalised as a policy in 1998, but there is as yet no national strategy mapped out for it. FIF

Editor's Note: These proposals have since been incorporated in the Budget 2003 outline for RE

Energy From Waste

A 'Waste-ful' Of Energy

WOOD waste can be an additional source of energy. Although competing uses of wood residues exist, environmentally sensitive disposal issues should be considered, and burning them efficiently for power generation is one of them.

The most economic method of extracting wood residues needs to be explored, and a comprehensive database on calorific values and densities of various wood types needs to be created.

Feasible wood-based cogeneration plants should be considered. Cogeneration is an efficient method of power generation which produces heat and electricity from a single source, with far less impacts on the environment The promotion of wood residues as an energy source is possible through the sale of power to the Tenaga Nasional Berhad grid and via different financial and fiscal measures.

The option of briquetting or converting wood wastes into wood pellets should also be considered for future power generation and alternative uses of wood waste quantified to ascertain its potential as an energy resource.

Incinerating municipal solid waste, although expensive, is to be preferred to landfills in waste disposal, as it is more environment-friendly: methane gas emissions from waste biodegradation is some 20 times more damaging than carbon dioxide as a greenhouse gas. There is also the problem of polluted ground water from leachate leakage.

While not really renewable energy, heat from waste combustion will reduce energy use from fossil fuels, but there a number of snags. Burning chloride derivatives in rubbish can result in the emission of carcinogenic dioxin, and some toxic wastes have to be incinerated at extremely high temperatures to neutralise poisonous gases and kill bacteria, necessitating the use of gas- or oil-fired burners.

Waste ought to be thoroughly sorted prior to incineration, as this will usually substantially reduce the amount of waste, and the number and size of incinerators to be invested in. Prior sorting will also identify rubbish that can be recycled. An on-going analysis of the country's urban waste composition is therefore required. Incinerators at appropriate sites can then be built to dispose of waste by combustion in efficient boilers to produce electricity.

Rice husk as fuel is still problematic at this stage (on burning in boilers, hot gas streams of silica particles corrode the superheated water tubes, causing them to leak), but biomass cogeneration technology has progressed considerably to make it feasible for power generation projects.

The Thais are already on to this, and we may want to follow suit considering that rice husk waste in mills will continue to grow with the increase in rice production. FIF

Glue-Laminated Technology

Grasping Glulam

Dr Tan Yu Eng from FRIM's Glulam Unit was selected to be one of the recipients of the Post-Graduate Student Research Project Award by the World Conference On Timber Engineering Committee in August for his doctoral thesis, an extract of which follows:-*

By Dr Tan Yu Eng (tanye@frim.gov.my)

THE natural variability of wood, in contrast to the more homogenous man-made building materials of steel, concrete and artificial composites such as fibreglass, has always been a challenge to timber researchers.

Dr Tan... Understanding the natural variability of wood

To make better use of wood, an attempt has been made to better understand the build up in stress that leads to different modes of failure in the use of glued-laminated timber (glulam).

Specifically, the objective of this investigation was to propose and validate a means of quantifying the effect of chosen critical parameters on the integrity of straight structural glued-laminated members in service.

To achieve this, the performance of glued-laminated wood blocks of different lay-up combinations was studied in a simulated, accelerated ageing environment.

Using a customised computer programme based on a three-dimensional Finite Difference Method (FDM) and Fick's second law, the time-marching moisture distribution in laminated blocks was generated. The moisture profile so produced was verified by experimental results of the vacuum-pressure treatment of the cyclic vacuum-pressure delamination test stipulated in the Malaysian Standards, MS 758 (1981) and the British Standards, BS 4169 (1988).

The three-dimensional stress distribution in the glued-laminated wood blocks resulting from the time varying moisture distribution was obtained by using firstly, a linear-elastic model (the LE-FEM model) and secondly, a non-linear model incorporating the mechano-sorptive effect (the MS-FEM model).

The tendency of the bonded members to delaminate at the glue plane or to fail in the wood substrate was predicted using failure criteria, which were proposed.

To facilitate modelling, all the necessary physical and mechanical properties of the tropical hardwood, chengal (*Neobalanocarpus heimii*), which was used in the investigation, were determined.

These properties included the elastic constants, the shrinkage and swelling coefficients, the mechano-sorptive coefficients and the moisture diffusion coefficients along the three orthotropic directions of wood.

As anticipated, the LE-FEM model did not give the true magnitude of prevailing stresses in the laminated blocks, but only a relative picture. The MS-FEM model, on the other hand, gave a more realistic and satisfactory prediction of the wood performance in the various combinations used in the blocks due to 'relaxation' of the impact of the otherwise disastrous stresses postulated by the LE-FEM model.

From the stress profiles computed, the tendency of the bonded wood to fail or delaminate was then established using a 'semi-quantitative' set of failure criteria based primarily on maximum stress. The failure stress was determined from the experiments conducted. All predictions were supported by the experimental results obtained.

The success of the MS-FEM model led to the simulation of the effects of several manufacturing practices in the glue-laminating industry including the use of laminations of different initial moisture content, different material properties and different geometry.

The prospect of incorporating the findings into current standards, and the assessment and development of new adhesives and coatings together with the impact on the country's plantation policy, are apparent. FIF

**Critical Parameters Affecting The Use Of Chengal For Structural Glue-Lamination*

Glue-Laminated Timber

Pencil Marks A Record

THE world's tallest pencil stands six storeys high (19.75 m) at the Faber-Castell factory site in Subang Jaya **(right)**. Completed in April this year, the scaled-up structure of the pencils produced by the company was constructed with FRIM as its consultant.

A total wood volume of 8,6351 m^3 and 4,815 kg of kiln-dried jelutong timber went into making the pencil, using glue lamination technology in order to obtain a straight and long-enough solid piece of wood. This method also allows natural timber defects such as knots, surface checking, splitting, shot holes, latex canals, leaf traces and blue stain fungi to be removed and the cut pieces salvaged via finger-jointing.

The timber was pressure-treated with light organic solvent preservative (LOSP) to prevent fungi and insect infestation

A.W. FABER-CASTELL (M) SDN BHD

Wood Composites

Composite Reinforcement

Dr Rahim Sudin from FRIM's Wood Composites Unit won the Outstanding Doctoral Research Award for his thesis awarded by the XXI IUFRO World Congress in Kuala Lumpur in August 2000. An extract of his study follows:-*

By Dr Rahim Sudin (rahims@frim.g ov.my)

BESIDES providing economic returns, the commercial use of oil palm residues in the form of its trunks and fronds is expected to minimize wastage, overcome pollution due to burning (although illegal) and supplement the shortage of wood fibres in the wood-based industries.

This study looks into the characteristics and disintegration of oil palm fibres for the manufacture and durability of cement composites, among others.

The durability of the composite was evaluated based on the retention or loss of mechanical and physical properties within an exposure period of 300 days by determining its modulus of rupture, modulus of elasticity, tensile strength, water absorption, thickness swelling and density.

Microstructural studies were carried out using a stereocompound microscope, scanning electron microscope and an electron probe microanalyser.

Both the trunks and fronds of the oil palm have a relatively high tensile strength, useful as reinforcement for composite manufacture.

Thermal analysis was used to demonstrate the differences between a 28-day and 300-day hydrated cement composite. The X-Ray Diffraction analysis exhibited the chemical compounds present in the aged oil palm fibre cement composite.

Dr Rahim... Peering into oil palm fibres

The durability tests indicated that most of the oil palm fibre cement composites produced with fly ash (FA), rice husk ash (RHA) and latex increased the mechanical strength properties during the early stage of exposure due to the continuous hardening process of the cement matrix.

However, the strength properties started to decline after reaching an optimum value at about 60-180 days of exposure. The effectiveness of FA, RHAand latex to improve the mechanical and physical properties of oil palm fibre cement composite is in the following order: RHA>FA>latex.

The study showed the strength properties of these composites satisfied the minimum requirement of various standards, and are comparable to those of commercial wood cement composites. FIF

**Development, Properties And Durability Of Oil Palm Fibre Cement Composite*

Timber Engineering

Timber Construction's A 'Bigfoot'

SUSTAINABILITY is becoming an issue in the building sector as well.

Robert Leicester, in a keynote address at the 7th World Conference On Timber Engineering in Shah Alam in August, stated that the use of timber for building purposes contributes a sizeable 20% of the total non-energy component of the ecological footprint.

"It will undoubtedly result in pressure from society for an improvement in the efficient use of timber and consequently, to new research projects," he said in his paper, *Future Directions Of Timber Engineering Research.*

The ecological footprint is a measurement to gauge our use of natural resources in terms of the hectarage needed for agriculture, land, timber, fisheries, infrastructure and carbon dioxide absorption.

Our planet's productive land and sea space of 11.4 billion ha can provide each of the six billion of us a footprint of 1.9 ha. But instead we're leaving footprints averaging 2.3 ha per person. We're not all equal culprits, though. Africans and Asians leave demure footprints of less than 1.4 ha in 1999, while Europeans leave prints of about 5 ha each. North Americans have the biggest paws of them all, at 9.6 ha per person.

Should we all aspire to live as the US of A, while keeping intact our current plant and wildlife ecology, land use efficiency must increase at least five- to ten-fold. FIF

before being cut into 600-mm lengths, with defects removed, and finger-jointed to a length of 4.2 m with an adhesive and hardener. The boards were further laminated length-wise to make up a length of 22 m. Pieces of the end-jointed lengths were then tongue-and-grooved and edge-glued together to the desired width.

The completed boards, after planing to the final thickness of 32 mm, were face-glued together in batches and subjected to a uniform pressure for at least three hours with a cramping device. Light sanding then followed. The laying of lead into a pre-cut groove of similar diameter was done when the half cross-section of the pencil was made.

A guided travelling circular saw was used to shape the pencil laminates to a 0.8 m-diameter hexagon and 'sharpen'the lead at the writing tip into a cone. Water-based paint was then used to coat the pencil that was sprayed with a lacquer finish.

Jelutong timber is commonly used for pencil-making as the wood is light and soft, making it easy to work with. It is also exceptionally stable. FIF

Information obtained from the paper, Report On The Construction Of The World's Tallest Pencil Using Glue Lamination Technology by Dr Tan Yu Eng (tanye@frim.gov.my) and Lim Seng Choon (limsc@frim.gov.my)

Timber Construction

Putting Back The Trust In Trusses

In June last year, Jabatan Kerja Raya (JKR) suspended the use of prefabricated timber roof truss construction for its projects after a few cases of collapses, seriously derailing the timber sector. But efforts to set right industry defects have begun to pay off, with the waiving of the suspension by the government body in May this year for trusses built under the supervision of a limited number of system providers

A QUALITY assurance (QA) scheme is being finalized to improve the standard of prefabricated timber roof truss construction in the country.

Among the proposals suggested are subjecting timber and nail plates to identification and stress grading by licensed graders and SIRIM testing respectively, with counter-checking by third parties. The scheme also specifies timber strength groupings to provide a wider base of species choice, with stress grades extended to the Standard Structural Grade, from the Select Structural Grade previously allowed for.

The scheme's task force specifies an average dry salt retention of 5.6 kg/m^3 for CCA(copper-chrome-arsenic) preservative treatment with timber dried to below 30% moisture content or at least surface dried according to the Malaysian Grading Rules (1984) before preservative treatment.

A technical guide-book on every aspect of prefabricated timber roof truss construction, supervision and inspection at every level of activity from design to pre- and post-fabrication, and installation of trusses on site are, at the same time, being called for by the timber industries involved, i.e. system providers, fabricators, sawmillers, preservative chemical suppliers and treaters[1].

Further, truss designs ought to be approved prior to its procurement, with pre-delivery inspection of fabricated trusses made mandatory and frequent random sampling done of materials used during the installation stage[1].

The scheme, being drafted by the Construction Industry Development Board (CIDB), is expected to be approved and implemented by the end of the year and eventually extended to private projects as well.

The Scheme comes in the wake of the suspension on prefabricated timber roof truss construction by JKR, the industry's largest single consumer, and after import substitution with steel trusses badly affected the industry which, in the period from 1996 to 2000, amounted to more than RM500 million a year for the housing sector alone.

"The suspension proved to be a blessing in disguise. It brought together all the parties involved to thrash out issues needed to upgrade the structural use of timber in this country," said Dr Tan Yu Eng from FRIM's Forest Products Technology Division.

Timber trusses have advantages over steel ones in that they are cheaper, provide local employment, save on foreign exchange and sourced from renewable resources. In terms of strength and durability, they are comparable to steel, with the proper choice and use of timber, and correct preservative treatment, where necessary, as proposed by the QA scheme.

Prefabrication is also a speedier form of construction that need not hinge on skilled labour as in conventional constuction (the nuts and bolts system, for example, which requires proper design drawings as well). The industry, however, has been experiencing deterioration in standards with quality control a low priority in the light of a domestic market uneducated in its consumer rights.

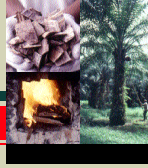
Prefabricated timber roof trusses constitute the last major structural application of our timber in the country. Transmission poles, guard rails, railway sleepers and timber piles were the structural uses that peaked, waned and ended in the past.

"Developed nations have systematically improved the use of their softwoods which are much weaker and less durable than our indigenous hardwoods through engineering knowledge, preservative technology and quality assurance procedures. It's time we sit up and take notice," said Dr Tan. FIF

Information obtained from Dr Tan Yu Eng (tanye@frim.gov.my) and the paper, Prefabricated Timber Roof Truss Industry – Current Scenario by Dr Tan, Mohd Nor Zamri Mat Amin (Malaysia Timber Industry Board) and Hanishahani Othman (CIDB) presented at the National Workshop On The Use Of Timber In Construction – Prefabricated Timber Roof Truss in July

[1] *Prefabricated Timber Roof Truss Suspension – Industry Perspective, paper presented by Patrick Wong (Masters Builders Association Malaysia), Ng Wun Pin (System Provider) and John Chang (Malaysian Wood Preserving Association) at the National Workshop On The Use Of Timber In Construction – Prefabricated Timber Roof Truss in July*

Structural adjustments... No more sub-standard prefab timber roof trusees are being promised



Wood Composites

Leftovers Put To Wood Use

FRIM's current and future research on making wood-based products from wood and oil palm waste

DWINDLING supplies of quality timber have meant a shift from solid wood to various types of wood composites for wood-based industries throughout the world, particularly in the furniture sector. In Malaysia, it is likely to be no different.

Particleboards, made from any lignocellulosic material that have been bonded together with synthetic resins or other binders under heat and pressure to form wood panels, are the earliest such products to emerge in the country since the mid-70s, using rubberwood and sawmill wastes as raw material. Half of our particleboard products are exported.

Using sawmill wastes of sentang to make particleboards and making these boards from admixtures of oil palm fibre in rubberwood, both show promising results. In the former case, boards tested for bending strength, internal bond, screw withdrawal, water absorption and thickness swelling satisfied the JIS A 5908 standard specification.

New lignocellulosic materials of oil palm fibres from trunks, fronds and empty fruit bunches will soon be readily available. Future potential products include the development of geotextiles and rubber composites for soft flooring purposes.

Research focusing on the development of water-, fungi- and fire-resistant particleboards is on-going. A new type of resin (latent crosslinking adhesive), besides other moisture-resistant adhesives are being tried for this purpose.

The use of juvenile sentang, acacia hybrids and teak for particleboard manufacture and the durability of moisture resistance particleboards from oil palm empty fruit bunch fibres are being explored for future research.

In 1991, the biggest worldwide upswing in consumption among wood-based panels was for wood fibre-blended medium-density fibreboards (MDFs).

The focus of research in this sector has been to search for alternatives to rubberwood to produce more value-added and specialty products. These include MDFs with enhanced properties from admixtures of rubber wood and oil palm fibre strands, and using *Acacia mangium*, *Acacia hybrids*, batai, yemane and oil palm stems for MDFs.

Wood cement boards (WCBs) combine the strength and durability of concrete with the workability and treatability of timber, and have high resistance to fire, termites, fungi and weathering, with excellent sound attenuation . Some 60% of our WCBs are exported.

Our research on oil palm fibre cement composites containing fly ash and rice husk ash have shown that these are comparable to that of commerical wood cement composites. FRIM has submitted a patent for its oil palm fibre reinforced lightweight cement board that will be used in a housing project (see 'Oil Palm Cement, Anyone?' in FIF's January/February/March 2002 issue).

Feasibility studies on using small diameter rubberwood branches for cement-bonded particleboards and the best potential mixtures for rice husk cement boards have also been done.

Orientated strand boards (OSBs) are new in this country, although they have been around since 1981 in North America and Europe. Made from long, thin and narrow strands of wood orientated parallel to each other within a layer, they have been successfully used in flooring, roofing and wall sheathing. However, in this region their use is still limited to non-construction purposes such as billboards and packaging boxes.

Their use, however, is anticipated to increase with depleting supplies of quality timber. OSBs can be made from lesser quality timber species with log diameters as small as 80mm. Comparable to plywood in terms of strength, the boards usually consist of at least three layers of strands where the core layer is perpendicular to the surface layers.

One area of research at FRIM is developing OSBs from the thinning of forest plantation species, while an OSB pilot plant is being considered for making laminated OSB using small-diameter rubberwood logs, for which a patent is being submitted.

We export more than 70% of our plywood (wood layers bonded by glue or resins and laid perpendicular to one another) which is ideal for a myriad number of uses from crates, packing boxes and boats to furniture and prefabricated buildings.

Laminated plywood and laminated veneer lumber (which has sparked new prefabrication techniques) is no stronger than solid wood, but its strength is distributed more uniformly and is less likely to be affected by humidity.

Fire-retardant plywood and plywood from oil palm veneer are areas for future research.

Interest in wood polymer composites (lignocellulosics that have been blended with plastics) renewed after plastic became expensive and the use of environment-friendly renewable biomass began to be taken seriously.

Wood fibres are superior to inorganic fillers such as fibreglass and minerals as fibre reinforcements in plastic composites because they are cheaper, lighter, less abrasive, abundant, biodegradable and not a health hazard during processing.

Plastic composites, in contrast to their metal counterparts, also have better mechanical properties considering their light weight, flexibility in design capabilities and an ease in fabrication. Such materials are suitable for temporary housing structures, panelling for interior wall sections and partitions, as well as furniture and automobile components.

The main obstacles in wood polymer composite manufacture are the poor compatibility and dispersibility of polar hydrophilic fibres with non-polar hydrophobic matrixes, and the thermal instability of wood fibres in polymer matrixes at temperatures above 200ºC.

To enhance the use of wood and agricultural waste such as rubberwood and oil palm residues, FRIM is keen to promote these composites as potential future products. The Institute is currently working with the Malaysian Institute For Nuclear Technology Research, Lembaga Getah Malaysia and Universiti Putra Malaysia to develop rubberwood fibre-reinforced polypropylene/Epoxidised Natural Rubber. FIF

Information obtained from Wood Chemistry Technical Advisory Panel Session presentations in July

Furniture Industry

Plying For Business

It's time to move on from plywood to designer furniture, even if we've come a long way from a producer of primary and secondary wood products in the 60s and 70s to more value-added furniture in the late 80s. And of course, here comes China…

LOCAL furniture producers ought to set up retail outlets of their own for more competitively-priced products with greater market access.

Improving design for the higher-end markets in Europe and the United States must also be targeted, with diversification in mind – such as upholstered furniture for the Japanese market.

With stiff competition from the classy Italians and innovative Germans, as well as from the Swedes, Spanish and North Americans, we can do nothing less.

Then there is burgeoning China. With more than 1.26 billion people with a birth rate of 16.12 per 1,000, many of them newlyweds hungry for furniture after the switch to individual home ownership from state/workplace-distributed housing, the Chinese should spell good news for us.

Firms from Hong Kong, Taiwan and Singapore have already set up shop there to capitalize on the rapidly growing domestic market. However, China is more likely to be a competitor than a market opportunity for Malaysian furniture producers at present.

Plentiful, cheap Chinese labour and more forests (163.5 million ha compared to our 19.3 million in year 2000) are reasons why. Chinese labour productivity is lower, but this fails to compensate for their lower labour costs. Shortfalls in wood supplies do not seem to faze the Chinese unduly either: they nimbly shift to other materials such as metal, plastic, stone and leather.

Our furniture exports are expected to rebound by year-end to RM5 billion, after dipping 12.7 per cent last year, its first drop in 16 years.[1] The US is our biggest export market, and in year 2000 we were the world's 10th largest exporter of furniture.[1]

Meanwhile, to secure sufficient rubberwood (80% of our current furniture material) for downstream processing, a policy on the different sizes to be used by the different processors must be enforced.[2] Medium-density fibreboards, for example, must be allowed to process only logs less than 10 cm in diameter, so that larger ones can be retained for conversion into sawn timber.

And now there is the added incentive for non-rubber plantations to grow rubber in at least 10% of their land.[3]

Supplies from the smallholding sector also needs to be fully explored: encouraging group harvesting to maximize profits for small, remote plantations, for instance, and making technology available to potential smallholder associations.[2]

Information obtained from the paper, China – A Major Competitor And A Market Opportunity For Malaysian Producers, Especially Those Of Wooden Furniture by Dr H. Norini (norini@frim.gov.my)

[1] *The New Straits Times, Sept 20, 2002*

[2] *From the paper, Supply And Demand Of Rubberwood In Peninsular Malaysia by Dr Norini, Dr W.C. Woon (woonwc@frim.gov.my) and Dr H.C. Sim (simhc@frim.gov.my)*

[3] *Budget 2003*

FRIM Services

Judgement Seats

From settees to cots – FRIM's furniture testing lab has assessed them all

POOR design and workmanship, rather than material defects, are reasons why furniture items fail tests at FRIM's furniture testing laboratory.

But thankfully, the cracks, fractures, loosening, deformation, creaking and faulty mechanical parts are confined to a minority of the items sent in for testing by local furniture firms.

"We test samples from as many as 200 companies a year, although business is a little slow these days," said Mohd. Arshad Saru at the Timber Technology Centre where the lab is housed.

The laboratory which started operations in 1989, obtained its accreditation in 1994 from the Furniture Industry Research Association in the United Kingdom, an internationally recognized authority on furniture certification and testing.

Chairs, stools, settees, tables, trolleys, beds, baby cots, storage and office furniture are among the many items regularly tested at the lab.

Furniture generally undergoes three basic types of tests. Static tests are used to assess the static strength of furniture under highest levels of loading that can reasonably be expected to occur (such as standing on an easy chair to open a window).

Fatigue tests are used to determine the strength of component parts by simulating repeated application of loads and component movements that occur during long-term use (such as sitting down and leaning back on a chair).

Impact tests are used to assess the impact strength of furniture under rapid rates of loading that occur occasionally (such as sitting down heavily onto a settee). For more information, contact Mohd Arshad at arshad@frim.gov.my or call him at 03-6279 7381.

Timber Verification

We'll Ace It, Knock On Wood

Industries can send wood samples to FRIM and the Malaysian Timber Industry Board (MTIB) to verify whether quality timber is being used

THERE is as yet no regulatory body to certify preservative treatments meet specifications. The result is treated timber in the market that is generally of low and inconsistent quality, having failed to follow recommended treatment methods.

Lower-priced dipped timbers are often passed off as CCA (copper-chrome-arsenic) pressure-treated timber. There is also the problem of inadequately trained personnel and improper equipment used in the treatment process.

FRIM conducts quantitative analysis of CCA-treated timber to ascertain whether treatment has been adequate.

Much timber needs to be treated with preservatives to prevent biodeterioration caused by fungi and insects, as naturally durable timber is not easily available. Shorter harvesting cycles that fell younger trees for timber also increase the need for preservatives as immature wood contains a higher proportion of biodeterioration-prone sapwood (as compared to heartwood in older trees).

The timber species, sizes and moisture content affect the extent of retention and penetration of the chemicals (usually CCA, boron and boron-based compounds and the least toxic light organic solvent preservative), and together with the purpose the timber is used for, determine the treatment schedule, chemical formulation and solution strength of the preservatives.

Timber has to be properly graded according to the Malaysian Grading Rules, an internationally recognized system for which MTIB is the grading authority. Grading ensures the elimination of defects such as knots and splits, which can affect the strength and performance of timber. This is an aspect that is often neglected when specifying timber in the construction industry.

The right timber for the right use must be adhered to if timber structures and products are to last. With the country endowed with more than 2,000 timber species, this can often prove difficult without the expertise of wood scientists.

Every year, FRIM receives more than 2,000 wood specimens for identification. This is done by observing cross sections of timbers with a x10 magnifier, or sometimes with a microscope for more minute features. Micro slides and a wood collection of more than 10,000 specimens in FRIM are further used as references.

FRIM officers are also available to conduct assessments on the use of timber in buildings, and to tailor courses on wood identification for clients. Information on timber is also published regularly and includes the Timber Technology Bulletin series, the Timber Design Handbook and A Dictionary Of Malaysian Timbers.

Moisture in timber leads to problems such as twisting, diamonding, bowing, cupping and springing that result in unwarranted biases against the use of timber. Timber accordingly must be dried. FRIM carries out tests on moisture content and wood density based on oven-dried weight and green volume. FIF

Information obtained from Salamah Selamat (salamahs@frim.gov.my) and the papers, Preservative Treatment: Do's & Don'ts – A Case Study Of Mock-Up Treatment For JKR Pre-Fabricated Timber Roof Truss Project by Salamah Selamat, Ani Sulaiman (anis@frim.gov.my), Salmiah Ujang (salmiah@frim.gov.my), Shaharuddin Hashim (ddin@frim.gov.my) & Mohd Dahlan Jantan (dahlan@frim.gov.my), and Timber Verification Services – Identification, Grading & Preservative Treatment by Mohd Nor Zamri Mat Amin, Zulkepli Abdul Rani (MTIB), Salamah Selamat and Lim Seng Choon (limsc@frim.gov.my)

Whip Up Nostalgia, Rescue A Heritage

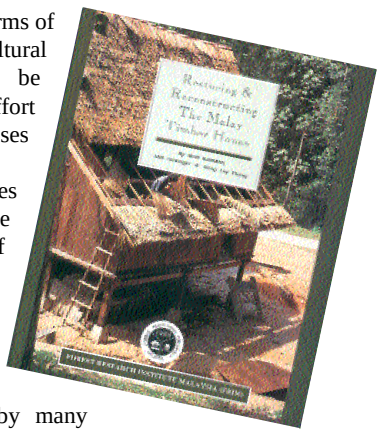
As you balik kampung this season, remember that timber house your nenek-moyang built

Restoring & Reconstructing The Mala y Timber House b y Wulf Killmann, Tom Sickinger & Hong Lay Thong; 1994/103 pages; RM35/US35; Order Code: FTIHB1

Review by Dr Gan Kee Seng

TIMBER houses are becoming rare, especially in the urban areas, as modern materials make an inroad into the Malaysian building industry. What's left are the old timber houses in traditional villages and many are also threatened and diminishing as development extends into these areas, bringing about demands for modern homes.

Many old timber houses are abandoned and in dilapidated condition, making them costly for individuals to repair. These are likely to be replaced with houses made of bricks and mortar. The loss in terms of architectural and cultural heritage will be immeasurable. Any effort to salvage these houses is commendable.



The traditional uses of timber in the construction of houses that have stood the test of time is a verification of the durability of the material that is hardly appreciated by many

More on next page

From previous page

younger Malaysians who have never set foot into one of these homes!

A big portion of this book is a record of hands-on relocation and reconstructing of selected timber houses to their former grandeur. The painstaking tasks – initial preparation work, dismantling, transportation and reconstruction – are detailed, and guidelines are provided for those intending to carry out relocation and/or reconstruction work. These houses are accessible at their new locations and they serve as a testimony to the successful translocation and reconstruction work. This certainly increases the worth of this book.

The many photographs in the book speak of the versatility of timber uses in construction for both its structural and decorative functions. Not many materials are more suitable than timber in this respect. The principal structure, design and functions of a traditional house are also described in this book. The diverse roofing materials that were used in old buildings show the harmonious blending of wood with other materials.

Being a natural product, timber is susceptible to bio-deterioration such as insect attacks and rotting due to fungi. These aspects are given appropriate treatment. The important visual inspection or the tell-tale signs of impending problem/weaknesses as a result of these attacks are discussed and elaborated with photographs.

However, this book has some flaws in it. Many figures that record the vivid details of timber uses for the various constructional components are not cited in the text, and the figures are not in the order of citation.

Technical sketches/drawings of the relevant houses do not correlate. For example, drawing 7 only shows the rumah ibu or the front portion of a Pahang house in drawing 8; drawing 10 showing the isometric view of the columns of an Alor Gajah house is not consistent with the layout in drawing 11. Drawing 14 cited in the text cannot be found. Drawing 13 is wrongly cited on page 85. Some of the drawings could be more useful if it were to be annotated to elaborate the traditional design and function of various portions of these houses.

Nonetheless, this remains a good reference for local timber enthusiasts and designers to appreciate the traditional use of timber in construction before the mushrooming of concrete and steel houses, in the name of modernity and seemingly better comfort. FIF

Dr Gan is from FRIM's Timber Technology Centre, Forest Products Technology Division

From Latex To Malaysian Oak

An essential text for anyone thinking of going into the rubber processing industry

Rubberwood Processing And Utilisation /L.T . Hong and H.C. Sim (Editors); 1999/254 pages; RM60/USD60; Order Code: MFR 39

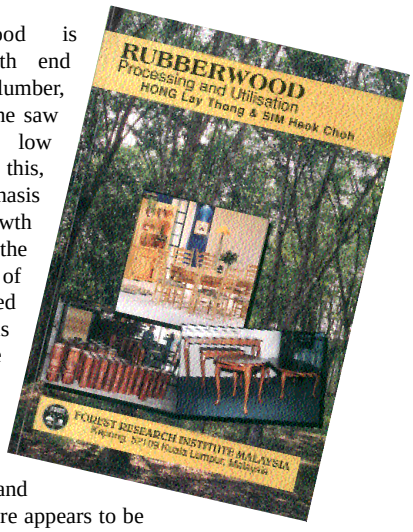
Review by Tony Haslett

HOW things have changed from the 60s and early 70s when, apart from fuel, the stem of rubber trees had little or no residual value at the finish of latex production. Today, there are large processing and export furniture industries that are entirely dependent on rubber trees in many countries: surely, one of the major success stories of tropical forestry.

Turning an unwanted by-product of another industry into an important material and industry in its own right does not happen by chance. The success story of the rubberwood processing industry is largely due to the collective efforts of numerous researchers and the successful application of technologies arising from their R&D.

This second edition provides a comprehensive summary of the path to the development of the rubberwood lumber processing industry and an outline of the properties of this now valuable resource. Well presented with numerous photographs and illustrations, it provides a good balance between the properties information gathered largely from Malaysian research (perhaps there could have been more space given to research from other countries) to applied processing recommendations. Clearly, it should be considered an essential text for any company considering the processing of rubberwood.

However, given their impact on processing there are some aspects which I consider the editors could have given more attention. Rubberwood is difficult to saw, with end splitting of logs and lumber, plus lumber warp off the saw causing degrade and low recoveries. Despite this, surprisingly little emphasis is given to stem growth stresses and how the deleterious effects of stresses can be minimised in sawing. Little space is given outlining the importance and mechanisms for twist, and how this can be ameliorated by the use of good stacking and stack weights. Also, there appears to be confusion between the use of final steaming to remove warp, as distinct from the removal of cell collapse.



Rubberwood generally has favourable machining, gluing and finishing properties and the book provides useful data and recommendations. As an aside, comparative data on other substitute wood species would have been of interest.

This book is not only likely to be of great use to rubberwood processors, but also in providing a summary of the development of the rubberwood processing industry. FIF

Haslett is National Technical Manager of Weyerhaeuser Australia

A Century's Research Retold

*A commemoration of the first 100 years of tropical forest research in Peninsular Malaysia**

Forest and Forest Products R & D in FRIM: Yesterday, Today & Tomorrow – 1901-2001 Centennial Celebration/ Jenny L.P. Wong (Editor); 2001/105 pages; RM70 /USD70; Order Code: 100Y

Review by Peter Ashton

THIS short book aims to promote the work of the Forest Research Institute Malaysia (FRIM).

The Institute is the de facto leading national forest research institute in the Far Eastern tropics that is home to the dipterocarps which have provided the lion's share of hardwood timber of international markets for almost 40 years now.

The historical and current research chapters make fascinating reading, well ornamented by early photographs dug from the archives. We learn with amazement, for example, that J.G. Watson, author of the classic treatise on the Mangrove Forests of the Malay Peninsula (1926), an account which has never been surpassed, was actually an economist! Those were the days of the gifted amateur.

And we are informed how the Institute has adapted to meet the research demands of successive Malaysia Development Plans, and the current changing emphasis in Malaysian forestry, from timber production alone to the protection and development of environmental and recreational services.

Curiously underplayed, though, are two stories crucial to the development of forestry in Malaysia. The continued research effort, starting in the 30s, which eventually led under John Wyatt-Smith to the formulation and successful testing of the only successful method for sustainable management of species-diverse tropical forest for timber, is not documented in any consistent way.

Neither is the havoc that economic change more rapid than the life cycle of a tree, has had on forest policy and management priorities been given the detailed consideration that it surely deserves. Economic change, in fact, has been the driving force behind the ever-changing priorities at FRIM.

Overall, more explanation even if brief, both of the underlying reasons why particular research was pursued, and of the methods used and their results, would have been informative. In this respect the chapter on the history of timber research, by Lim, Suffian and Shaharuddin stands out as a nice exception, fascinating to read even to this field naturalist.

Here again though a bit more on the revolution, in the timber industry and silviculture alike, that resulted from the early work in the 30s on pressure treatment of Malayan timbers, would have been welcome.

In colonial times, forestry research proceeded substantially independently of economic reality. Forests were regarded as much as social goods as commercial assets, though economic as much as ecological realities eventually determined where forests would survive. Nowadays, the rapid commercialization of research results is the major priority, goaded on by current criteria for future research funding.

Further chapters on current environmental research and public education at FRIM, and the research effort in traditional forest medicines and other non-timber products are provided, though greater detail, as suggested for other chapters, would have been desirable.

Here again, a realistic assessment of the present and likely future value of these goods and services, by a resource economist of the modern school, would have set these initiatives in context.

Scientific forestry in Malaysia is arguably now at the most crucial turning point in its history. Agriculture during the last three decades has pressed the forest estate back almost exclusively to lands marginal to agriculture. But the failure of the current Malaysian Selection System to yield a second timber harvest in anything like the time demanded by economists and commercial interests reflects, in part, that these remaining forested lands are marginal for forestry too.

On the other hand, there are signs that the high tide of plantation agriculture in Peninsular Malaysia is receding; forested lands scheduled for agricultural development have not been taken up, and the area under plantations is declining as the agricultural workforce has been drawn off the land by burgeoning opportunities in industry.

Underlying these massive changes in economic potential for the land, in which opportunities for the new forestry of services as much as timber beckon so clearly, is an economic trend that has almost universally accompanied successful development, throughout the world.

What does this mean for the role of plantations in the forest economy? What kind of timber, and what size of tree, will be demanded from the natural forest estate? How can timber production and conservation of the ever more important service values of forest hydrology, recreation values, and the carbon sequestration and biodiversity values for which the global industrialised community must eventually be goaded into paying rental, be most satisfactorily reconciled?

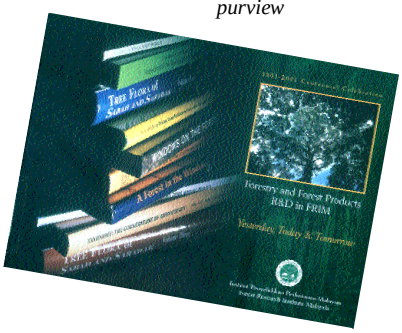
These massive challenges, with their need for a revolutionary, more multidisciplinary and integrated research approach, and for a union of ecology with the new economics now, face FRIM's scientists and science policy directors.

Disappointingly the final chapter, on future challenges, fails to provide the vision which FRIM must have if it is to retain leadership. Instead, we are presented with a very general and conventional wish list, without careful analysis of the problems to be faced, nor any clear definition of priorities.

One comes away suspecting that this book was produced in a hurry, and that it was not given the attention that it deserved. Even its production bears signs of haste: the spine of my copy became detached within days. This is a pity. The need for a compelling case for forestry research in Malaysia's rapidly modernising economic and social environment has never been greater. FIF

Ashton is currently a Charles Bullard Research Professor Of Forestry And Faculty Fellow in the Center For International Development Of The Kennedy School Of Government at Harvard University in the United States

** Apart from FRIM's current direction of a Tree Flora of Sabah and Sarawak project, the East Malaysian states are not included as their forestry is outside FRIM's purview*



FRIM Happenings

It's That Time Of Year Again

IT WAS a measure of jubilee glee for some researchers as they received recognition on FRIM's Annual Awards And Anniversary Day on October 12.

The **Best (Project) Research Award** was for the pilot scale production of medium density fiberboards from oil palm empty fruit bunches, won by six officers at FRIM's Wood Chemistry Division. This division also clinched the **Excellent (Group) Service Award**.

The papers, In Vitro Antifilarial Effects On Three Plant Species Against Adult Worms Of Subperiodic Brugia malayi and Supply And Demand Of Rubberwood In Peninsular Malaysia, won the **Best Publication Awards** in the technical and non-technical categories respectively.

Common Trees In Peat Swamp Forests Of Peninsular Malaysia won the **Book Merit Award**, while the **Best Handbook** was Penyakit, Perosak Dan Gangguan Terhadap Tanaman Sentang Dan Cara-cara Mengatasinya (Diseases, Pests And Disorders Of Sentang Trees And Their Treatment).

The **Best Thesis Award** was on the rehabilitation of the degraded peat swamp forest in the Raja Musa Forest Reserve in Selangor.

The event was officiated by Primary Industries Minister Datuk Seri Lim Keng Yaik who also declared open the Institute's new Forest Biotechnology Building that houses the Medicinal Plant and Forest Plantation divisions.

The Minister urged FRIM to aspire to be the world's premier reference centre for tropical forest research. He said the Institute should also play a key role in upgrading the country's various botanic gardens to be educational and recreational parks of repute.

Meanwhile, FRIM's Annual Report 2001 **(right)** won the second prize in **Dewan Bahasa Dan Pustaka' s Best Annual Report Award (Statutory Bodies)** for this year. FIF