TECHNICAL SERIES
26

NEW DIRECTIONS
FOR TROPICAL PLYWOOD



PROCEEDINGS OF AN ITTO/FAO
INTERNATIONAL CONFERENCE
ON TROPICAL PLYWOOD

26–28 SEPTEMBER 2005
BEIJING, CHINA

INTERNATIONAL TROPICAL TIMBER ORGANIZATION

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INTERNATIONAL TROPICAL TIMBER ORGANIZATION
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
INTERNATIONAL FORESTRY COOPERATION CENTER

New directions for tropical plywood
Proceedings of an ITTO/FAO international conference on tropical plywood

ITTO Technical Series No 26

The ITTO/FAO International Conference on Tropical Plywood was convened by ITTO with technical assistance from FAO and hosted by China's International Forestry Cooperation Center in Beijing, China 26–28 September 2005.

The International Tropical Timber Organization (ITTO) is an intergovernmental organization promoting the conservation and sustainable management, use and trade of tropical forest resources. Its 59 members represent about 80% of the world's tropical forests and 90% of the global tropical timber trade. ITTO develops internationally agreed policy documents to promote sustainable forest management and forest conservation and assists tropical member countries to adapt such policies to local circumstances and to implement them in the field through projects. In addition, ITTO collects, analyses and disseminates data on the production and trade of tropical timber and funds a range of projects and other action aimed at developing industries at both community and industrial scales. All projects are funded by voluntary contributions, mostly from consuming member countries. Since it became operational in 1987, ITTO has funded more than 750 projects, pre-projects and activities valued at more than US$290 million. The major donors are the governments of Japan, Switzerland and the US. ITTO contact details can be found on the back cover.

This report is made available by ITTO as part of its policy of contributing in a timely manner to public debate on issues related to the conservation and sustainable management, use and trade of tropical forest resources.

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Foreword

Since the International Tropical Timber Organization (ITTO) convened the first World Conference on Tropical Plywood in Jakarta, Indonesia, in 1991, the tropical plywood industry has undergone huge change. Indonesia's dominance of the world market has been increasingly challenged by other producers, such as China, but also by other panel products. Prices plummeted in the wake of the Asian financial crisis in 1997 (and only recently started to recover), the supply of large-diameter logs has dwindled, and there have been significant shifts in the manufacturing capacities of producer countries.

The recommendation of the 36th session of the International Tropical Timber Council in 2004 that a second international conference on tropical plywood be held to update producers, consumers and other stakeholders on tropical plywood production and trade and to identify key issues for the promotion of a more competitive tropical plywood industry was therefore very timely.

Such a conference was duly organized by ITTO in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and the Chinese State Forestry Administration (International Forestry Cooperation Center) as the host agency. It was held on 26–28 September 2005, in Beijing, a very appropriate venue given China's rapidly emerging role in the production, consumption and trade of tropical plywood.

The conference provided a valuable opportunity for tropical plywood producers and consumers to exchange facts, views and experiences on the industry. Presentations were made and lively panel discussions held on the opportunities and challenges for international trade and technological developments in plywood manufacturing. Issues such as raw-material supply, sustainability and accountability reminded participants of the importance of continued progress towards the sustainable management and use of forest resources. Finally, the meeting confirmed the commitment of both producers and consumers to improving corporate responsibility as an important element of their business activities.

We would like to express our gratitude to the Government of China for its warm hospitality in hosting the conference and to the International Forestry Cooperation Center for its excellent technical and logistic support.

We hope that governments, tropical plywood producer and trade associations and relevant national and international agencies will follow up on the conclusions and recommendations resulting from this conference. By so doing they will help maximize the contribution of the tropical plywood industry to the conservation and sustainable management, use and trade of tropical forest resources and the alleviation of poverty in ITTO and FAO member countries.

Manoel Sobral Filho
Executive Director
International Tropical Timber Organization

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Director
Forest Products and Economics Division
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Acronyms

ABIMCI	Brazilian Association for Mechanically Processed Timber (Associação Brasileira da Indústria de Madeira Processada Mecanicamente)
AIMEX	Industrias Exportadoras de Madera del Estado de Pará (Brazil)
AMMG	APKINDO MPMA Marketing Group
APKINDO	Indonesian Wood Panel Producers Association
ATIBT	L'Association Technique Internationale des Bois Tropicaux
BRIK	Indonesia Forest Industry Revitalization Board
CERFLOR	Brazilian Program of Forest Certification
CIFOR	Center for International Forestry Research
CP	Concrete panel
CSR	Corporate social responsibility
CSRC	China Securities Regulatory Commission
CTB	Commercial trade barrier
CTPAT	Customs Trade Partnership Against Terrorism
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FB	Floor base
FFPRI	Forestry and Forest Products Research Institute (Japan)
FIPPI	Federation of Indian Plywood and Panel Industry
FLEGT	Forest law enforcement, governance and trade
FOB	Free-on-board
FSC	Forest Stewardship Council
GFSM	Global Fibre Supply Model
IFCC	International Forestry Cooperation Center (China)
IHPA	International Hardwood Products Association
IPPC	International Plant Protection Commission
ISO	International Standards Organization
ISPM 15	International Standards for Phystosanitary Measures No 15
ITTO	International Tropical Timber Organization
IUFRO	International Union of Forestry Research Organizations
IWPA	International Wood Products Association (US)
JAS	Japan Agricultural Standard
JIS	Japanese Industrial Standard
JPMA	Japan Plywood Manufacturers' Association
MAI	Mean annual increment
MDF	Medium-density fibreboard
MIS	Market Information Service
MLIT	Ministry of Land, Infrastructure and Transport (Japan)
MOU	Memorandum of understanding
MPMA	Malaysian Panel-Products Manufacturers' Association
MTCC	Malaysian Timber Certification Council
MTIB	Malaysian Timber Industry Board
NGO	Non-governmental organization
NPWQ	National Program on Wood Quality (Brazil)
NTTB	Non-tariff trade barrier
OSB	Oriented strandboard
PNG	Papua New Guinea
ppm	Parts per million
RPP	Responsible purchasing policy
SFM	Sustainable forest management
SHFE	Shanghai Futures Exchange
SKSHH	Surat Keterangan Sah Hasil Hutan (Indonesia)
SODEFOR	Société de Développement des Forêts (Côte d'Ivoire)
SP	Structural panel
SPIB	Syndicate des Producteurs Industries du Bois (Côte d'Ivoire)
STCP	STCP Engenharia de Projetos Ltda (Brazil)
SWOT	Strengths, weaknesses, opportunities, threats
TTB	Tariff trade barrier
TTF	Timber Trade Federation (UK)
UK	United Kingdom of Great Britain and Northern Ireland
US	United States of America
VOC	Volatile organic compounds
WTO	World Trade Organization

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Chair: Professor Kelin Ye, Director, Research Institute of Wood Industry, Chinese Academy of Forestry

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- Production and trade of tropical plywood in China, present status and outlook – Professor Kelin Ye, Director, Research Institute of Wood Industry, Chinese Academy of Forestry
- Asia's production and trade of tropical plywood, present status and outlook – Mrs Loke Sim Wah, Malaysian Timber Industry Board (MTIB)
- Latin America's production and trade of tropical plywood, present status and outlook – Dr Ivan Tomaselli, STCP, Brazil
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- North America: Mr Stuart Clarke, International Wood Products Association (IWPA), United States of America (US)
- Europe: Mr Andy Roby, United Kingdom (UK) Timber Trade Federation
- India: Mr M. M. Jalan, ex-President, Federation of Indian Plywood and Panel Industry (FIPPI)

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Chair: Mr Paul Vantomme, ITTO

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- Competition and tropical plywood substitution by other products – Mr Stephen Lau, Malaysian Panel-Products Manufacturer's Association (MPMA)
- Why China is so competitive in tropical plywood manufacturing – Mr Shengfu Wu, Director, Marketing Department, China Forest Products Industry Association
- Trends of tropical plywood prices – Dr Jairo Castaño, Market Information Service (MIS), ITTO
- Listing tropical plywood on the Shanghai Futures Exchange – Mr Wang Lei, Shanghai Futures Exchange
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- *Keynote address* on structural changes in the tropical plywood industry and improving tropical plywood mill profitability – Mr Manuel T. Durini
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- Adding more value to tropical plywood by innovative products – Mr Giorgio Agnoletti, Alpi S.p.A., Italy, Cameroon

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Chair: Mr Jean Jacques Landrot, L'Association Technique Internationale des Bois Tropicaux (ATIBT)

- *Keynote address* on tropical plywood: a plantation-based industry or logging natural forests – Mr Jean Jacques Landrot
- Challenges of certifying tropical plywood for the global markets – Mr Chew Lye Teng, Malaysian Timber Certification Council (MTCC), Malaysia
- Successful cases of tropical plywood production: from reforestation with tropical species – Mr Silvio Coutinho, Floresteca, Brazil
- The raw material supply for tropical plywood: a global outlook – Mr Olman Serrano

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Chair: Mr Alhassan Attah

- Corporate social responsibility – Mr. Andy Roby
- Private sector/trade association perspectives on tropical plywood manufacturing and trade:
  - Indonesia: Mr Njoto Suhardojojo, APKINDO, and Mr Simon Simansyah, Indonesia Forest Industry Revitalization Board (BRIK)
  - Malaysia: Mr Tan Seng Hock, Samling Strategic Corporation
  - Côte d'Ivoire: Mr W. Birkenmaier, Syndicate des Producteurs Industries du Bois (SPIB)

Conclusions and Recommendations of the Conference

Chaired by ITTO, FAO and the International Forestry Cooperation Center of China (IFCC)

- Overview of the main issues raised during the conference and the way ahead, recommendations and summary of conference output

Summary

Session 1: Production and Trade of Tropical Plywood

- Statistics and lack of market transparency remain problematic;
- Over the last decade, the substitution of tropical plywood increased: global production and trade in tropical plywood decreased while other wood-based panels showed significant growth;
- Prices for tropical plywood plummeted following the Asian financial crisis, with no sign yet of a strong price recovery;
- Indonesian production and exports are likely to decline further, leaving Malaysia as the top tropical plywood exporter;
- China will stabilize production and expand exports, although maybe not as fast as in the past, and could be the No 1 exporter by 2007;
- Brazil will continue to increase plantation coniferous plywood production and trade faster than tropical plywood production;
- Africa will continue to increase production and trade from a low base, but growth depends on investment and market access;
- Japan will continue to shrink as a (tropical) plywood producer/importer;
- the United States (US) market for wood-based panels will continue to grow, although probably less so for tropical plywood;
- European Union (EU) trade of wood panels (imports and exports) will continue a downward trend, slowly for imports and probably a faster-declining trend for exports;
- India's plywood production is growing fast and its market and export potential are increasing.

Session 2: Opportunities and Challenges for Tropical Plywood Trade

- Basic challenges: dwindling (tropical) log supplies; increased competition; reduced market share and more difficult access to markets; increased price volatility;
- New products (artificial laminate, film, wire mesh, combi-ply), softwood plywood and reconstituted panels (mainly oriented strandboard) will continue to reduce demand for tropical plywood;
- Increasing pressure from export logistics as a result of high oil prices, vessel shortages, etc, will continue to increase the costs of tropical plywood production and trade;
- The forest industry, especially the tropical forest industry, is highly regulated, with numerous legal and regulations imposed along the process and supply chains;
- Non tariff trade barriers (NTTBs) are gaining more importance and are increasing costs for tropical plywood production;
- Tropical countries' expertise in overcoming NTTBs or other market requirements is low and is dependent on international expertise;
- Tropical plywood is affected by sharp price fluctuations and poor price transparency;
- China will soon be the largest tropical plywood producer and will further monopolize the low-value segment of the tropical plywood market. Other producers, such as Malaysia and Indonesia, have few options other than to move up the value chain with more value-added products;
- Chinese plywood will continue to substitute Asian, African and Latin American products and its quality will continue to improve;
- Tropical plywood will retain niche market segments where high-quality uses are required.

Session 3: Technological Developments

- More technical innovations are needed to adjust to smaller diameters, increase processing efficiencies and produce more value-added products;
- There is a need to improve tropical plywood quality control testing and procedures;
- Different standards and testing procedures with no mutual recognition are limiting the access of tropical plywood producers to markets;
- Costs for quality certification are generally high, which limits market access, especially for small tropical plywood producers.

Session 4: Raw Material Supply

- Progress towards sustainable forest management (SFM) and the certification of natural tropical forests should proceed faster and over larger areas;
- A shift to plantation-based supply will continue for several technical, financial and environmental reasons, but natural forests in the tropics will still supply the bulk of production for the next decade;
- Compliance with SFM, legality and chain-of-custody market requirements will increase;
- Certification, timber procurement schemes (private, government) and chain-of-custody systems are increasing the cost of log production. Price premiums are neither guaranteed nor uniform across markets. In some sensitive markets, such as the UK, there are indications that premiums of 2–30% are emerging;
- Exports of tropical logs will become increasingly more restricted, while log exports from temperate and boreal sources (mainly Russia) will increase;
- Tropical natural forests have not attracted significant private investments due to low economic returns and political, social and environmental reasons.

Session 5: Corporate Responsibilities

- Environmental and social concerns will increase, leading to more regulation and procurement policies/rules in the market;
- Corporate responsibility requirements will increase and should be applied equally to all (tropical) plywood manufacturers and raw material/log suppliers, including those in China and Russia.

Conference Recommendations

In collaboration with ITTO member countries, tropical plywood producer and trade associations and relevant national and international agencies involved in promoting the sustainable production and trade of forest products from tropical countries, the conference urges ITTO to:

- prepare and help implement national strategies to strengthen the development of tropical plywood industries through, among other things, reviewing sustainable sources of wood supply, including from natural forests, plantations and imports from other tropical timber producers; and analyze the private sector's investment opportunities for improving tropical plywood manufacturing and trade;
- enhance the capacities of tropical plywood-producing countries in:
  - implementing SFM in natural tropical forests and developing appropriate policies/incentives for plantation development in the tropics,
  - developing and providing relevant incentives for increasing product quality and for producing more value-added products,
  - better understanding and complying with market requirements such as quality standards, NTTBs, procurement policies and other market access impediments and mechanisms,
  - promoting the use, image and sustainable trade of tropical plywood;
- assist tropical plywood producer and trader associations to strengthen their capacities to service their members by:
  - improving information-sharing and training on appropriate processing technologies and market intelligence,
  - helping tropical producer associations in their lobbying capacities and strategies to advance sustainable forest industry development in their countries and generally in the tropics,
  - promoting initiatives, such as elaborating appropriate codes of conduct, to help tropical plywood producer and trading companies to participate actively on the international stage to improve their environmental and social corporate responsibilities;
- promote tropical plywood produced from sustainable sources in the international markets, by, among other things:
  - reviewing procurement policies (including the role of public procurement policies in encouraging products from sustainable managed forests through the provision of a price premium for such products) and facilitating their mutual recognition and market access, considering discussions under the Doha Agenda of the World Trade Organization,

  - in collaboration with other agencies and tropical plywood trade associations, assisting and facilitating discussions and initiatives between tropical plywood producers and consumers to address price volatility and price insurance options and remediate the lack of market transparency, such as, for example, by evaluating and reactivating, as appropriate, the listing of tropical plywood on the Shanghai Futures Exchange,
  - supporting producing countries to combat illegal logging and trade in illegally produced timber products,
  - supporting the harmonization of grading standards of tropical plywood among the markets;
- enhance the exchange of information at national, regional and global levels on tropical plywood production and trade between producers, traders and consumers by, among other things:
  - strengthening ITTO's Market Information Service,
  - convening, at regular intervals (every four years), an international conference on tropical plywood,
  - convening expert meetings on specific technical issues,
  - undertaking in-depth market studies for tropical plywood in major consumer markets,
  - conducting comparative studies on the production costs and technologies of tropical and non-tropical plywood in the major producer countries,
  - carrying out projects, conducting national seminars and training sessions, and publishing relevant information in ITTO's technical series, etc;
- analyze and promote appropriate financing systems and ways of increasing (private-sector) conditional investment as a tool for promoting tropical forests and tropical plywood production;
- in collaboration with the World Customs Organization and relevant trade associations, review the Harmonized System Chapter: 44.12, including the listing of tropical species, to better define tropical plywood so as to improve trade statistics;
- in collaboration with relevant agencies (FAO, ITTO, the International Union of Forestry Research Organizations, the Center for International Forestry Research, and others) and countries, support and improve ongoing forest resource assessment and forest management assessments, especially to qualify and quantify the available timber supply for industrial uses and future trends; and
- make the materials presented at the conference and its proceedings (including translations of a summary of the conference and its recommendations in Chinese, Spanish and French) widely available.

会议总结

第一部分：热带胶合板生产和贸易

1、 统计资料和市场透明度仍然存在问题；

2、 在过去的10年里，热带胶合板的替代产品有所增加，全球热带胶合板的生产和贸易下降而其它人造板的市场和贸易明显增长；

3、 热带胶合板价格在亚洲金融危机后仍然低迷，尚看不到任何复苏迹象；

4、 印度尼西亚胶合板生产和出口将继续下滑，马来西亚将成为最大的热带胶合板出口国；

5、 中国胶合板将稳定生产，扩大出口，尽管发展速度将不会像以前那么快，但到2007年将有可能成为世界最大的胶合板出口国；

6、 巴西将持续扩大人工林针叶材胶合板的生产和贸易，其速度将超过热带胶合板的发展速度；

7、 非洲将在较低的基数上继续扩大生产和贸易，但增长速度取决于投资和市场准入状况；

8、 日本胶合板（包括热带胶合板）的生产和进口将继续萎缩；

9、 美国人造板市场将继续增长，但热带胶合板市场增长将相对缓慢；

10、欧洲人造板进出口将继续持下滑态势，人造板进口缓慢下滑而出口快速下滑；

11、印度胶合板生产正在快速增长，市场需求和出口潜力将增加 。

第二部分：热带胶合板贸易机遇和挑战并存

1、 根本问题：原木（包括热带原木）供给萎缩；竞争加剧；市场份额减少而市场准入更加困难；价格变化更加反复无常；

2、 人造单板、装饰薄膜、金属丝网、混合材胶合板等新产品以及针叶材胶合板和重组人造板（以定向刨花板为主）将继续挤压热带胶合板需求；

3、 由于油价上涨和运输船只紧张等原因，出口物流压力将造成热带胶合板生产和贸易的成本增加；

4、 森林工业（尤其是热带森林工业）管制非常严格，在加工和供应环节上设有许许多多的法律法规；

5、 非关税技术壁垒（NTTBs）影响越来越重要，造成热带胶合板生产成本增加；

6、 热带国家克服非关税技术壁垒（NTTBs）或满足市场要求的专门知识能力不强，依赖于国际专家；

7、 价格的剧烈波动和透明度不高对热带胶合板的影响很大；

8、 中国将很快成为最大的热带胶合板生产国并将进一步垄断低价热带胶合板市场，其它胶合板生产国（如马来西亚和印度尼西亚）在低价热带胶合板市场机会很少，在价值链上转向生产附加值更高的产品；

9、 中国胶合板将继续取代亚洲、美洲和拉丁美洲产品，产品质量将继续提高；

10、热带胶合板在优质产品市场将保持适当的份额 。

第三部分：技术开发

1、 要加强技术创新，适应小径材加工、提高加工效率和生产高附加值产品的需要；

2、 要改进热带胶合板质量控制检验和加工工序；

3、 胶合板产品标准和质量检测方法的差异和缺乏统一的标准正在限制热带胶合板生产商进入市场；

4、 一般来说，质量认证成本较高，限制了市场的接受程度，对小的胶合板生产商尤其如此 。

第四部分：原材料供应

1、 可持续森林经营（SFM）和天然热带森林认证进程应该加快，区域也要扩大；

2、 由于技术、金融和环境等等原因，胶合板原材料将继续向人工林转移，但在未来10年内热带天然林还将大量出产木材；

3、 可持续森林经营（SFM）一致性、合法性和产销链监管的市场要求将提高；

4、 森林认证、木材采购规程（私人企业和政府）和产销链监管体系正在增加木材生产成本，价格升水在市场上既得不到保证也不一致 。在一些敏感市场（如英国），有迹象表明，价格升水2-30%是可能的 。

5、 热带原木出口将更为受到限制，而来自于温带和寒带资源（如俄国）的原木出口将增加；

6、 由于投资回报低和政治、社会和环境等原因，热带天然林对大额私人投资吸引力不大 。

第五部分：企业责任

1、 对环境和社会问题的关注将更为增多，导致市场上更多的法规以及采购政策/规定出台；

2、 对企业的社会责任要求更高，所有胶合板（包括热带胶合板）制造商和原料/原木供应商（包括中国的和俄国的）的企业应同样承担起应尽的社会责任 。

会议建议

会议与国际热带木材组织（ITTO）成员国、热带胶合板生产商和贸易协会以及致力于促进热带国家林产品可持续生产和贸易的有关国内机构和国际组织一起，敦请国际热带木材组织：

1、 通过检视木材供给的可持续资源（包括天然林 、人工林和从其它热带木材生产国进口的木材），分析私人投资机会和增进热带胶合板制造和贸易等方法，协助有关国家制定和实施加强热带胶合板工业的国家战略；

2、 在以下方面增强热带胶合板生产国的能力；

- 在天然热带森林实施可持续森林管理（SFM），对热带地区人工林发展采取适当的政策和激励措施；
- 为提高产品质量和生产附加值更高的产品制定并实施有关激励措施；
- 更好地理解和遵守市场要求，如质量标准 、非关税技术壁垒（NTTBs）、采购政策和其它市场准入障碍和机制；
- 加强热带胶合板应用、提高热带胶合板形象和增强热带胶合板可持续贸易 。

3、 在以下方面支持热带胶合板生产商和贸易商协会，提高他们服务于成员的能力：

- 加强信息共享以及适用加工技术和市场信息资讯方面的培训；
- 帮助热带胶合板生产商协会提高游说能力及制定战略，从而推动本国或总的来说热带地区的森林工业的可持续发展；
- 采取诸如产品代码共享等行动，帮助热带胶合板生产商和贸易公司积极参与国际事务，增强他们的企业环境责任和社会责任 。

4、 采取以下行动，在国际市场上推广用可持续资源生产的热带胶合板：

- 检视采购政策（包括发挥公共采购政策作用，通过价格升水的措施，鼓励使用来自可持续经营森林的产品），促进采购政策互认和市场准入，考虑在世界贸易组织（WTO）多哈议程下进行讨论；
- 与其它组织和热带胶合板贸易协会一起，支持和促进在热带胶合板生产国和消费国之间对胶合板价格的反复无常和价格保险方案进行讨论并采取行动，弥补市场透明度不高的缺憾，例如，如果合适，评估和重新将热带胶合板在上海期货交易市场挂牌交易 。
- 支持生产国对非法生产的木材产品采取反对非法采伐和非法贸易的措施；
- 支持在市场上统一热带胶合板等级标准 。

5、 采取以下行动，在国家、地区和全球范围内以及在热带胶合板生产商、贸易商和消费者之间，加强热带胶合板生产和贸易的信息交流：

- 加强国际热带木材组织（ITTO）的市场信息服务功能；
- 定期（每4年一次）召开国际热带胶合板大会；
- 对特别技术问题召开专家会议；
- 在主要的消费市场开展深入的热带胶合板市场研究；
- 在主要生产国开展热带胶合板和非热带胶合板生产成本和技术的比较研究；
- 开展项目活动，召开国内研讨会和培训班以及在国际热带木材组织（ITTO）技术系列报告上发布有关信息 。

6、 分析和推广合适的金融体系以及拓宽有条件的（私人部分）投资渠道，促进热带森林和热带胶合板生产 。

7、 与世界关税组织和有关贸易协会共同检视一致性系统章节（44.12），包括热带木材树种清单，更好地定义热带胶合板，从而改进贸易统计 。

8、 与有关机构（联合国粮农组织、国际热带木材组织 、国际林业研究组织同盟和国际林业研究中心等）和国家共同支持和改进当前的森林资源评价和森林经营评价体系，特别是要定性地和定量地对已有的工业用木材供给及其发展趋势进行评价 。

9、 最后，将此份文件在本次大会上散发 。同时，将本次会议论文集（包括会议总结和建议的中文本 、西班牙文本和法文本）广为发放 。

Résumé

Session 1: Production et Commerce des Contreplaqués Tropicaux

- Les statistiques et l'absence de transparence du marché restent problématiques ;
- Au cours de la décennie écoulée, le remplacement du contreplaqué d'origine tropicale s'est intensifié : la production et le commerce à l'échelle mondiale ont décru tandis que d'autres panneaux de bois ont montré une croissance sensible ;
- Les prix du contreplaqué tropical se sont effondrés à l'issue de la crise financière asiatique, sans donner encore de signes d'une forte remontée ;
- La production et les exportations indonésiennes sont appelées à poursuivre leur baisse, ce qui devrait faire de la Malaisie le premier exportateur de contreplaqués tropicaux ;
- La Chine est appelée à stabiliser sa production et à élargir ses exportations, même si le rythme de cette progression pourrait être inférieur à ce qu'il a été par le passé ; la Chine pourrait ainsi devenir le premier exportateur de contreplaqué en 2007 ;
- Le Brésil continuera d'augmenter sa production de contreplaqués de bois de conifères tiré de plantations, et son commerce sera plus intense que sa production de contreplaqués tropicaux ;
- La production et le commerce des contreplaqués africains continueront de progresser à partir de niveaux bas, mais cette progression restera fonction des investissements et de l'accès aux marchés ;
- La production et les importations japonaises de contreplaqués tropicaux continueront de décroître ;
- Le marché états-uniens des panneaux à base bois continuera de croître, bien que vraisemblablement dans une moindre mesure s'agissant des contreplaqués tropicaux ;
- Le commerce des panneaux de bois mené par l'Union européenne (importations et exportations) continuera de baisser ; cette baisse sera moins précipitée pour les importations que pour les exportations ;
- La production indienne de contreplaqué progresse plus rapidement et ses potentialités sur le marché intérieur et à l'exportation sont en progression.

Session 2: Le Commerce des Contreplaqués Tropicaux Face aux Possibilités et aux Défis

- Les défis principaux: recul de l'offre de grumes (tropicales) ; concurrence accrue ; réduction des parts de marché et difficultés croissantes à accéder aux marchés ; accentuation de la volatilité des prix ;
- Les nouveaux produits (lamibois, feuillures, trellis métalliques, contreplaqués mixtes ou combinés), contreplaqués de résineux et panneaux en bois reconstitué (principalement les panneaux structuraux orientés) continueront de faire baisser la demande de contreplaqués tropicaux ;
- L'augmentation de la pression que fait peser la logistique des exportations du fait des prix du pétrole élevés, du manque de navires, etc., continueront de pousser à la hausse les coûts de la production et du commerce des contreplaqués tropicaux ;
- La filière forêt-bois, plus particulièrement la filière forêt-bois tropicale, est soumise à de lourdes réglementations, qui imposent le respect de nombreuses dispositions juridiques et règlementaires à tous les stades de l'offre ;
- Les obstacles non tarifaires au commerce gagnent en importance et font monter les coûts de production du contreplaqué tropical ;
- Les savoir-faire qui permettraient de surmonter les obstacles non tarifaires au commerce et les autres exigences des marchés sont faiblement développés dans les pays tropicaux et sont tributaires des savoir-faire étrangers ;
- Les contreplaqués de bois tropicaux souffrent de grandes fluctuations et d'une transparence insuffisante des prix ;
- La Chine est appelée à devenir bientôt le plus grand producteur de contreplaqués tropicaux et continuera de monopoliser le segment inférieur du marché des contreplaqués tropicaux. Les autres producteurs que sont la Malaisie et l'Indonésie n'ont guère d'autre choix que de se porter vers les segments supérieurs en produisant des produits plus valorisés ;

- Les contreplaqués chinois continueront de prendre la place des produits asiatiques, africains et latino-américains et leur qualité continuera de s'améliorer ;
- Les contreplaqués tropicaux conserveront des créneaux de marché où des utilisations finales de qualité sont requises.

Session 3: Actualité Technologique

- De nouvelles innovations technologiques sont nécessaires pour permettre de travailler les bois ronds de plus petit diamètre, accroître les rendements matière des opérations de transformation et produire davantage de produits valorisés ;
- Il est nécessaire de perfectionner les essais et procédures de contrôle de qualité des contreplaqués tropicaux ;
- Différentes normes et procédures d'essai sans reconnaissance mutuelle n'ont d'autre but que de permettre aux producteurs de contreplaqués tropicaux d'accéder aux marchés ;
- Les coûts de la certification de qualité sont généralement élevés, ce qui limite l'accès aux marchés, en particulier celui des petits producteurs de contreplaqués tropicaux.

Session 4: L'offre de Matière Première

- La progression vers la gestion durable des forêts et la certification des forêts tropicales naturelles devrait être plus rapide et sur des superficies plus grandes ;
- L'offre émanant des plantations est appelée à gagner du terrain pour plusieurs raisons d'ordres technique, financier et environnemental, mais les forêts naturelles sous les tropiques continueront d'assurer le gros de la production pendant la prochaine décennie ;
- La conformité aux exigences de la gestion forestière durable, à celles de la légalité et de la traçabilité ira croissant ;
- Les systèmes de certification et de marchés publics et les systèmes de traçabilité visant le bois alourdissent les coûts de production des grumes. La bonification des prix pour le vendeur n'est ni garantie ni uniforme d'un marché à l'autre. Dans certains marchés sensibles, tel celui du Royaume-Uni, il apparaît que ces systèmes permettent une bonification des prix de vente qui varie entre 2 et 30 pour cent.
- Les exportations de grumes tropicales se verront de plus en plus restreintes, tandis que les exportations de grumes de sources tempérées ou boréales (principalement Russie) sont appelées à progresser ;
- Les forêts tropicales naturelles n'ont pas attiré d'investissements privés notables en raison de la faible rentabilité économique qu'elles offrent et des conditions politiques, sociales et écologiques de leur production.

Session 5: Responsabilité Citoyenne des Entreprises

- Les préoccupations environnementales et sociales iront augmentant, ce qui entraînera un alourdissement des réglementations et des règles et principes encadrant les marchés publics ;
- La responsabilité citoyenne des entreprises sera de plus en plus exigée et devrait s'appliquer à régime égal aux fabricants de contreplaqués (tropicaux) et aux fournisseurs de matière première et de bois ronds, y compris aux fournisseurs et fabricants de Chine et de Russie.

RECOMMANDATIONS DE LA CONFÉRENCE

En collaboration avec les pays membres de l'OIBT, les associations professionnelles de la filière des contreplaqués tropicaux et les organismes nationaux et internationaux pertinents oeuvrant à la promotion de la production et du commerce durables des produits forestiers issus des pays tropicaux, la Conférence exhorte l'OIBT à :

- Élaborer et aider à la mise en œuvre de stratégies nationales destinées à renforcer le développement des entreprises de la filière du contreplaqué en bois tropical, en procédant notamment à un bilan des sources durables de l'offre de bois, dont celles des forêts naturelles, des plantations et les importations d'autres producteurs de bois tropicaux ; et analyser les possibilités d'investissements par le secteur privé dans l'amélioration de la fabrication et de la commercialisation des contreplaqués tropicaux ;
- Accroître les capacités des pays producteurs de contreplaqués tropicaux à:
  - Réaliser la gestion durable dans les forêts tropicales naturelles et élaborer des politiques et incitations adaptées à l'aménagement de plantations sous les tropiques,

  - Mettre au point et dispenser des incitations utiles à l'augmentation de qualité des produits et à la production de produits valorisés,
  - Mieux comprendre et faire appliquer les exigences du marché que sont les normes de qualité, les obstacles non tarifaires, les principes régissant les passations de marchés publics et d'autres obstacles et mécanismes freinant l'accès au marché,
  - Promouvoir l'utilisation, l'image et le commerce durable des contreplaqués tropicaux ;
- Aider les producteurs et les associations professionnelles du métier des contreplaqués tropicaux à renforcer leurs capacités à servir leurs membres en :
  - Améliorant l'échange d'informations et les formations aux techniques appropriées de transformation ainsi qu'aux techniques de veille sur le marché,
  - Aidant les associations de producteurs tropicaux à renforcer leurs capacités et leurs stratégies de sollicitation des pouvoirs publics destinées à faire progresser le développement durable de la filière forêt-bois dans leur pays et plus généralement dans le monde tropical,
  - Promouvant des initiatives, telles que l'élaboration de chartes et codes de conduite adaptés, qui aident les producteurs de contreplaqués tropicaux et les entreprises commerciales à participer activement sur la scène internationale à l'amélioration de leur environnement et à affirmer leurs responsabilités citoyennes ;
- Promouvoir les contreplaqués tropicaux issus de sources durables sur les marchés internationaux, entre autres en effectuant les actions suivantes :
  - Examiner les principes encadrant les passations de marchés publics (dont la faveur qu'ils accordent aux produits issus de forêts en gestion durable dès lors qu'ils prévoient leur acception à des prix majorés) et faciliter leur reconnaissance mutuelle et l'accès aux marchés, en prenant en considération les discussions du cycle de Doha de l'Organisation mondiale du commerce,
  - En collaboration avec d'autres agences et les associations professionnelles des contreplaqués tropicaux, fournir l'assistance requise et faciliter les discussions et initiatives entre producteurs et consommateurs de contreplaqués tropicaux en vue de corriger la volatilité des prix et d'instaurer des options d'assurance prix et remédier au manque de transparence du marché, par exemple en évaluant et en réactivant, selon besoin, la cotation des contreplaqués tropicaux sur la bourse des marchés à terme de Shanghaï,
  - Épauler les pays producteurs dans leur lutte contre l'exploitation forestière clandestine et le commerce de produits ligneux de production illicite,
  - Épauler l'harmonisation des normes de classement des contreplaqués tropicaux entre les marchés ;
- Renforcer l'échange d'informations aux niveaux national, régional et mondial en matière de production et de commerce des contreplaqués tropicaux entre producteurs, négociants et consommateurs, notamment en :
  - Renforçant le Service OIBT d'information sur le marché,
  - Réunissant, à intervalles réguliers (tous les quatre ans) une conférence internationale sur les contreplaqués tropicaux,
  - Organisant des réunions d'experts sur des questions techniques spécifiques,
  - Mettant en œuvre des études de marché approfondies sur les contreplaqués tropicaux dans les grands marchés de consommation,
  - Effectuant des études comparatives sur les coûts et les technologies de production des contreplaqués tropicaux et non tropicaux dans les grands pays producteurs,
  - Exécutant des projets, organisant des séminaires nationaux et des sessions de formation, et en publiant des informations pertinentes dans les séries techniques de l'OIBT, etc ;
- Analyser et promouvoir des systèmes de financement appropriés et des moyens d'accroître (secteur privé) des investissements conditionnels comme outil de promotion des forêts tropicales et de la production de contreplaqués tropicaux ;

- En collaboration avec l'Organisation douanière internationale et les associations professionnelles concernées, examiner le chapitre 44.12 du Système harmonisé, notamment la liste des essences tropicales, afin de mieux définir le contreplaqué tropical et d'améliorer les statistiques du commerce ;
- En collaboration avec les organismes concernés (FAO, OIBT, Union internationale des organismes de recherche forestière, Centre pour la recherche forestière internationale, et d'autres) et des pays, appuyer et améliorer l'évaluation des ressources forestières en cours et les évaluations de la gestion forestière, afin notamment de qualifier et de quantifier l'offre de bois disponible aux usages industriels et les tendances futures dans ce domaine ;
- Rendre largement disponibles les matériaux présentés à la Conférence et les actes de la Conférence (y compris les traductions d'un résumé de la conférence et de ses recommandations en chinois, espagnol et français).

Resumen

Sesión 1: Producción y comercio de contrachapados de madera tropical

- Las estadísticas y la falta de transparencia de los mercados siguen representando un problema;
- Durante el último decenio, se registró un aumento de la sustitución de los contrachapados de madera tropical: hubo una reducción mundial de la producción y el comercio de contrachapados de madera tropical mientras que los tableros de otras maderas registraron un aumento importante;
- Los precios de los contrachapados de madera tropical cayeron drásticamente después de la crisis financiera de Asia, y aún no hay señales de recuperación importante de los precios;
- Es probable que la producción y las exportaciones de Indonesia sigan disminuyendo, con lo que Malasia pasaría a ser el primer exportador de contrachapados de madera tropical;
- La producción de China se estabilizará y sus exportaciones aumentarán, aunque probablemente no al mismo ritmo acelerado del pasado; China podría convertirse en el primer exportador en el año 2007;
- Brasil seguirá aumentando la producción y el comercio de contrachapados de coníferas de plantación a un ritmo más acelerado que la producción de contrachapados de madera tropical;
- La producción y el comercio de África seguirán incrementándose a partir de un nivel bajo, pero el aumento dependerá de las inversiones y del acceso a los mercados;
- La posición de Japón como productor/importador de contrachapados (de madera tropical) seguirá decreciendo;
- El mercado norteamericano (EE.UU.) de tableros de madera seguirá aumentando, a pesar de que el aumento será menor en el rubro de contrachapados de madera tropical;
- El comercio de tableros de madera (importaciones y exportaciones) en la Unión Europea (UE) seguirá bajando a un ritmo lento para las importaciones y probablemente a un ritmo más acelerado en el caso de las exportaciones;
- La producción de contrachapados de la India está aumentando a un ritmo acelerado y su mercado y potencial de exportación también se están incrementando.

Sesión 2: Oportunidades y retos para el comercio de contrachapados de madera tropical

- Los desafíos fundamentales son la contracción de la oferta de trozas (de madera tropical), el aumento de la competencia, la contracción de la participación del mercado y la mayor dificultad de acceso a los mercados, y el aumento de la volatilidad de precios;
- Los productos nuevos (laminado artificial, película, alambre tejido, contrachapado combinado), contrachapados de maderas blandas y tableros reconstituidos (principalmente tableros de fibra orientada) seguirán reduciendo la demanda de contrachapados de madera tropical;
- Las crecientes presiones logísticas relacionadas con las exportaciones a raíz de los precios elevados del petróleo, la escasez de buques, etc., seguirán aumentando los costos de producción y comercio de contrachapados de madera tropical;
- La industria forestal, especialmente en el trópico, está sumamente reglamentada y sujeta a numerosas leyes y reglas impuestas a lo largo de las cadenas de producción y suministro;
- Las barreras no arancelarias del comercio (BNAC) están cobrando mayor importancia, por lo que se aumentan los costos de producción de contrachapados de madera tropical;
- Los países tropicales tienen poca experiencia en materia de afrontar las BNAC u otras exigencias del mercado, y dependen de los conocimientos de expertos internacionales;
- Los contrachapados de madera tropical se ven afectados por pronunciadas fluctuaciones de precios y por la falta de transparencia en los precios;
- China pronto pasará a ser el principal productor de contrachapados de madera tropical y monopolizará aún más el segmento de menor valor del mercado de estos productos. Otros productores, tales como

Malasia e Indonesia, tienen pocas opciones más que subir a una escala superior en la cadena de valor con productos de mayor valor agregado;

- Los contrachapados chinos seguirán sustituyendo los productos asiáticos, africanos y latinoamericanos, y su calidad seguirá mejorando;
- Los contrachapados de madera tropical retendrán ciertos nichos del mercado que exigen alta calidad.

Sesión 3: Avance tecnológico

- Se requieren más innovaciones tecnológicas para ajustarse a diámetros menores, aumentar la eficiencia de la producción y producir productos de mayor valor agregado;
- Existe la necesidad de mejorar las pruebas y los procedimientos de control de calidad de los contrachapados de madera tropical;
- La divergencia de normas y procedimientos de prueba que carecen de reconocimiento mutuo limita el acceso de los productores de contrachapados de madera tropical a los mercados;
- En general, la certificación de calidad tiene un costo elevado, lo que limita el acceso a los mercados, especialmente para los pequeños productores de contrachapados de madera tropical.

Sesión 4: La oferta de materia prima

- El proceso de la ordenación forestal sostenible (OFS) y de la certificación de los bosques tropicales naturales debería avanzar a un ritmo más acelerado y abarcar un área de mayor extensión;
- Por diversos motivos técnicos, financieros y ambientales, continuará la tendencia en favor de los suministros derivados de plantaciones, pero los bosques naturales de las zonas tropicales seguirán suministrando el grueso de la producción durante los próximos diez años;
- Aumentará el nivel de cumplimiento de los requisitos del mercado en materia de OFS, legalidad y cadena de custodia;
- Los sistemas (privados y gubernamentales) de certificación, adquisiciones de madera y cadena de custodia están aumentando el costo de la producción de madera en troza. No hay garantía de poder obtener sobreprecios (primas) ni precios uniformes en todos los mercados. En algunos mercados sensibles tales como el Reino Unido, hay indicaciones de que se están comenzando a aplicar primas del 2–30%;
- Las exportaciones de trozas de madera tropical estarán sujetas a crecientes restricciones, mientras que las exportaciones de trozas de fuentes templadas y boreales (principalmente Rusia) se incrementarán;
- Los bosques tropicales naturales no han atraído importantes inversiones del sector privado debido a los bajos rendimientos económicos y a motivos políticos, sociales y ambientales.

Sesión 5: Responsabilidades corporativas

- Las inquietudes ambientales y sociales aumentarán, lo que llevará a una mayor reglamentación y políticas/normas más estrictas en materia de adquisiciones en el mercado;
- Aumentarán las exigencias en materia de responsabilidad corporativa, que se deberán aplicar de la misma manera a todos los fabricantes de contrachapados de madera tropical y proveedores de materia prima/trozas, incluso los de China y Rusia.

Recomendaciones de la conferencia

En un esfuerzo de colaboración entre los países miembros de la OIMT, las asociaciones de productores y comerciantes de contrachapados de madera tropical y los organismos nacionales e internacionales pertinentes dedicados a la promoción de la producción sostenible y el comercio de productos forestales de los países tropicales, los participantes de la conferencia instan a la OIMT a:

- preparar estrategias nacionales destinadas a fortalecer el desarrollo de las industrias de contrachapados de madera tropical mediante el examen de las fuentes sostenibles de suministros de madera, inclusive los bosques naturales, plantaciones forestales e importaciones de otros productores de madera tropical, y contribuir a la ejecución de tales estrategias. Asimismo, analizar las oportunidades de inversión para el sector privado destinadas a mejorar la fabricación y el comercio de contrachapados de madera tropical;
- aumentar las capacidades de los países productores de contrachapados de madera tropical en materia de:

  - aplicación de prácticas de OFS en los bosques tropicales naturales y formulación de políticas/ incentivos apropiados para el desarrollo de plantaciones en las zonas tropicales,
  - formulación y prestación de incentivos pertinentes para aumentar la calidad del producto y facilitar la producción de productos de mayor valor agregado,
  - mayor comprensión y cumplimiento de los requisitos del mercado tales como niveles de calidad, barreras no arancelarias del comercio, políticas de adquisición, y otros impedimentos y mecanismos del mercado,
  - promoción del uso, la imagen y el comercio sostenible de contrachapados de madera tropical;
- ayudar a las asociaciones de productores y comerciantes de contrachapados de madera tropical a fortalecer su capacidad para prestar servicios a sus socios mediante:
  - un mayor intercambio de información y capacitación relativa a tecnologías apropiadas de transformación e información sobre el mercado,
  - la prestación de ayuda a las asociaciones de productores tropicales en sus actividades de cabildeo y formulación de estrategias para fomentar el desarrollo de la industria forestal sostenible en sus países y en las zonas tropicales en general,
  - la promoción de iniciativas tales como la elaboración de códigos apropiados de conducta, para ayudar a los productores y comerciantes de contrachapados de madera tropical a participar activamente en el plano internacional con miras a mejorar sus responsabilidades corporativas ambientales y sociales;
- promover los contrachapados de madera tropical provenientes de fuentes sostenibles en los mercados internacionales, mediante:
  - el examen de las políticas de adquisición (incluso el papel de las políticas de adquisiciones públicas que fomentan los productos de bosques sujetos a ordenación sostenible mediante el pago de una prima en el precio de dichos productos) y facilitación de su reconocimiento mutuo y del acceso a los mercados, tomando en consideración las deliberaciones mantenidas en el ámbito del Programa de Doha de la Organización Mundial del Comercio,
  - la prestación de ayuda, en colaboración con otros organismos y asociaciones del comercio de contrachapados de madera tropical, y facilitación de las deliberaciones e iniciativas entre los productores y consumidores de contrachapados de madera tropical para abordar la volatilidad de precios y las opciones de seguro de precios, y solución a la falta de transparencia en los mercados, por ejemplo, mediante la evaluación y reactivación, según corresponda, de la cotización de los contrachapados de madera tropical en la Bolsa de Futuros de Shangai,
  - apoyo a los países productores en su lucha contra la tala ilegal y el comercio de productos de madera producidos ilegalmente,
  - apoyo a la armonización de las normas de clasificación de los contrachapados de madera tropical en los diferentes mercados;
- mejorar y aumentar el intercambio de información, a nivel nacional, regional y mundial, sobre la producción y el comercio de los contrachapados de madera tropical, entre productores, comerciantes y consumidores, mediante:
  - el fortalecimiento del Servicio de Información sobre el Mercado (SIM) de la OIMT,
  - la convocación de una conferencia internacional sobre contrachapados de madera tropical a intervalos regulares (cada cuatro años),
  - la convocación de reuniones de expertos sobre cuestiones técnicas específicas,
  - la realización de estudios exhaustivos del mercado de los contrachapados de madera tropical en los principales países consumidores,
  - la realización de estudios comparativos sobre los costos y tecnologías de producción de contrachapados de madera tropical y no tropical en los principales países productores,
  - la ejecución de proyectos, organización de seminarios nacionales y jornadas de capacitación, y publicación de información pertinente en la serie técnica de la OIMT, etc.;
- analizar y promover sistemas apropiados de financiamiento y maneras de aumentar las inversiones condicionales del sector privado como instrumento de fomento de los bosques tropicales y de la producción de contrachapados de madera tropical;

- en colaboración con la Organización Mundial de Aduanas y las asociaciones comerciales pertinentes, examinar el Capítulo 44.12 del Sistema Armonizado, en particular, el listado de especies tropicales, para definir mejor los contrachapados de madera tropical de modo que se puedan mejorar las estadísticas del comercio;
- en colaboración con los organismos pertinentes (FAO, OIMT, la Unión Internacional de Organizaciones de Investigación Forestal, el Centro de Investigación Forestal Internacional y otros) y los países correspondientes, apoyar y mejorar la evaluación constante de los recursos forestales, especialmente con miras a la calificación y cuantificación de la oferta de madera disponible para usos industriales y las tendencias futuras; y
- distribuir ampliamente los materiales presentados en la conferencia y sus actas (inclusive las traducciones de un resumen de la conferencia y sus recomendaciones en chino, español y francés).

Opening address

Alhassan Attah, Chair
International Tropical Timber Council

Your Excellencies,

The Representative of the State Forestry Administration of China;

Mr. Liu Hongcun, Deputy Director General of International Cooperation;

Mr. Su Ming, Director of the IFCC;

Mr. Jean Jacques Landrot, President of ATIBT; and Mr Olman Serrano, of FAO

Distinguished Participants;

Ladies and Gentlemen,

It is a great pleasure and honour for me to be present here this morning on behalf of the International Tropical Timber Council, to say a few words on the occasion of the opening of the ITTO/FAO International Conference on Tropical Plywood. For me this is a unique opportunity that brings together so many stakeholders and experts in the tropical plywood business from all over the world to deliberate on issues that affect the trade in tropical plywood in this beautiful city of Beijing.

Allow me first and foremost to thank our Chinese hosts and counterpart agency, in particular the Chinese State Forestry Administration, for the excellent arrangements they have put in place to ensure that this conference is a success.

Let me also take this opportunity, on behalf of ITTO and its Executive Director, Dr Sobral, to convey my sincere gratitude to FAO and in particular Dr Hosny El Lakany, Assistant Director General of the Forestry Department, for having provided exemplary leadership that has allowed our two organizations to work closely in recent times to our mutual benefit and for the advancement of tropical forestry. More specifically, ITTO and FAO have worked as partners to convene this conference. We have also worked together on our joint questionnaire to provide information to support the development of the tropical timber industry and trade for the benefit of people whose livelihoods depend on tropical forests.

I also wish to extend my thanks to Mr Jean Jacques Landrot, President of the Association Technique des Bois Tropicaux, for his Association's technical support to this conference.

Ladies and gentlemen, this is the fourth time that ITTO has convened an international conference on tropical plywood, and much has changed since the first one held in Jakarta Indonesia in 1991, fourteen years ago. Today, China's exports of tropical timber products, in particular plywood, have seen tremendous growth. Although this development is encouraging it is also a source of concern to some tropical timber-producing countries, who have found the Chinese competitive. There are also concerns with regards to the sources of China's massive imports of raw material, a concern that both China and the supply countries must work together to address in the short term if the market share of tropical timber is not to be lost to other competing products. With the natural disasters that have occurred recently, from the tsunamis in Southeast Asia to the hurricanes in North America, the public is going to be once again critical of tropical timber and how tropical forests are managed and harvested. Our ability to manage the potential negative publicity will to a large extent depend on how we are able to show the credibility of our source of material and address issues related to illegal logging.

Mr. Chairman, Distinguished Delegates,
The tropical plywood sector is now under strong threat from other plywood and wood-based panels. Since 1991, the global production of wood-based panels has increased by more then 50%. That of total world plywood production (ie tropical and non-tropical) increased by some 20% but the production of tropical plywood has hardly changed over the same period. Problems with log supply have certainly played a role in this, but other factors such as the lack of transparency in tropical plywood markets and price instability due to over-supply and an inability to manage production and stocks of plywood have also contributed to the current difficult situation for tropical plywood. This situation has attracted the attention of ITTO and has resulted in a number of studies, in particular the one that resulted in the publication 'Reviving Tropical Plywood', which in my view is a must-read for plywood manufacturers, traders and international trade policy-makers. I recommend this publication to you and ITTO has taken the liberty to include copies in your folders.

Mr Chairman,
Prior to the Asian crisis in 1997, 2.7-mm Indonesian plywood, the largest category of tropical plywood in international markets, was fetching around US$700/m^3; at one time it peaked at US$780/m^3. However with the Asian crisis the prices of tropical plywood have suffered, marking a turning point for the international trade in tropical plywood. Prices plummeted to as low as US$250/m^3 and have been at this level until recently. The collapse of plywood prices has had dire consequences in tropical producer countries. Companies are reported to have collapsed, workers laid off and foreign exchange earnings have shrunk, leading to further reductions in budgetary allocations to support SFM in producer countries. With the recent oil crisis there are bound to be uncertainties and I am hopeful that your deliberations at this conference over the next three days will provide some guidance as to the actions required by ITTO to support the tropical plywood trade, particularly in its member countries.

Mr Chairman, Distinguished Participants,
Timber, like other commodities, has generally shown long-term downward trends and high levels of price instability. This has dire consequences for the economies of tropical timber-producing countries, whose economies are very dependent on commodities, in particular timber exports. Our ability to reverse this situation will to a large extent depend on the level of value addition in producer countries and to the extent to which producer-country domestic and regional markets can act as buffers to stabilize prices.

Mr Chairman,
Let me at this stage comment on the changing nature of the wood-based panels' trade. The production and trade of wood-based panels – plywood, particleboard, fibreboard, veneers, oriented strandboard (OSB) and other reconstituted panels – have seen substantial increment in recent years. This growth has however been most pronounced in China, which has experienced about a fivefold growth in production, while Africa has experienced the least growth. Other countries that have experienced changes in their plywood sectors include Brazil, China, Indonesia and Japan. These have all seen major upheavals in recent years and the industry is in search of a new equilibrium, in which China must play a fundamental role.

China has become a key player in the plywood market, and has been able to compete with Indonesian producers, even in the Indonesian domestic marketplace. Developments in China's plywood sector have been the most dramatic of all and have clearly not yet played out fully. China's production and consumption of plywood have been rising for years and are expected to remain strong for many years to come. Not long ago China was a major plywood importer but it has now become the world's third-largest tropical plywood producer, the second-largest consumer and close to Brazil as the third-largest exporter. Contrary to the declines that characterize the plywood industries in many other countries, China is experiencing growth in its plywood industry and this momentum is projected to continue given its production efficiency and the competitiveness of its prices in international markets.

Distinguished Delegates, Ladies and Gentlemen;
The strategic importance of this conference is to enhance mutual understanding of the many and complex issues involved along the supply chain in the production and trade of tropical plywood. I am hopeful that some concrete and practical proposals will emanate from this conference so as to stimulate tropical plywood production and strengthen its market share among wood-based panels internationally.

Permit me to also assure you that ITTO is dedicated to the conservation and sustainable management, use and trade of tropical forest resources. Though the tropical plywood sector remains in a fragile state, it is ITTO's hope that this conference will help to catalyze the action that is needed by all players if the sector is to flourish once more. On that note, I have the pleasure of wishing you all a very productive and enriching meeting.

Thank you for your attention.

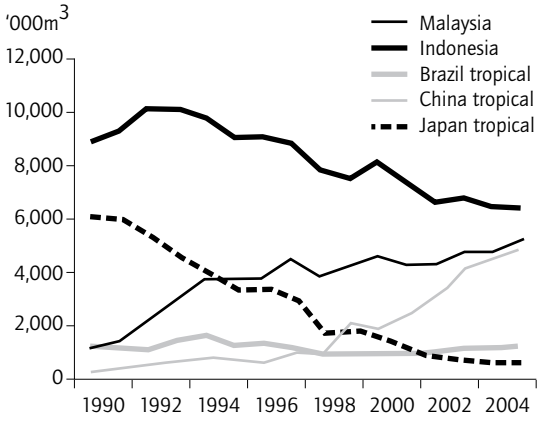
Session I: Production and Trade Trends of Tropical Plywood

Global trends in production and trade in tropical plywood and their outlook

Steven Johnson
ITTO Secretariat

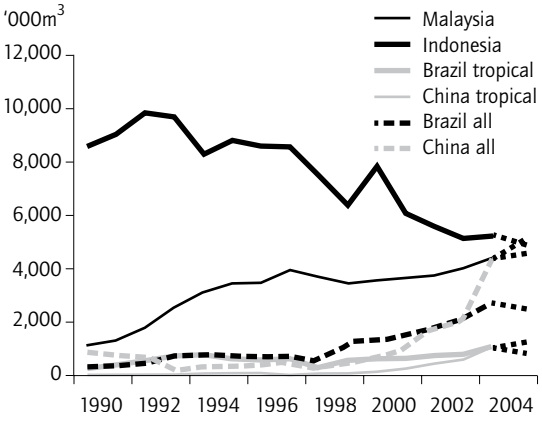
Tropical plywood production and trade have seen marked changes over the past 15 years. While statistics are not always reliable, all evidence points to steady declines in Indonesian and Japanese production, with Malaysia and (especially) China experiencing steady growth (Figure 1). Brazil's production has been more or less stable over this period, while Africa has increased production and exports sharply from a negligible base.

Figure 1. Tropical plywood production trends



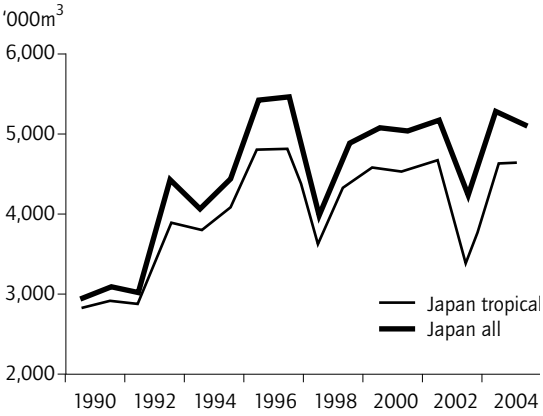
Indonesia remains the largest tropical plywood exporter, but at levels of only half its peak of around 10 million m^3 per year in the early 1990s it is likely to be eclipsed soon by Malaysia. Brazil's tropical exports have decreased in recent years as the country has focused on coniferous plywood exports, with the result that China's booming exports of tropical ply (which grew from virtually nothing in the late 1990s to a forecast 1.1 million m^3 in 2005) should overtake Brazil's exports this year (Figure 2).

Figure 2. Plywood export trends



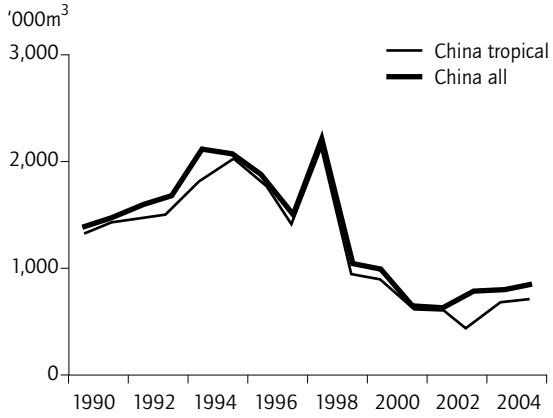
Plywood remains the only wood product for which tropical countries account for a majority of international markets, but this share has slid from over 70% to under 60% since the early 1990s (in contrast, tropical countries' share of global reconstituted panel exports has doubled from 4% to 8% during the same period). Among importers, Japan remains by far the largest (currently at around 4.5 million m^3 per year, Figure 3), although future demand is set to decline due to substitution by coniferous ply and reconstituted panels together with demographic changes leading to decreased housing starts and wood demand.

Figure 3. Plywood import trends – Japan



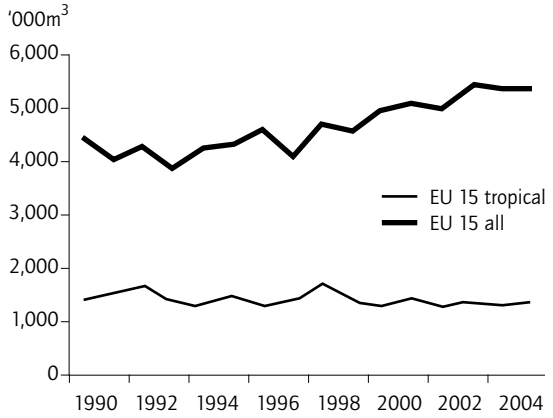
China's imports have shrunk from over 2 million m^3 in the mid 1990s to around 700,000 m^3 today, as domestic production based on imported logs and veneer has escalated dramatically.

Figure 4. Plywood import trends – China



While the vast majority of both China's and Japan's plywood imports remain tropical, other major markets (EU, US) import 4–5 times as much coniferous ply as tropical (see Figure 5). This has always (or at least over the past 15 years) been the case in Europe, but in the US it is a more recent phenomenon, with coniferous imports from several countries (but especially Brazil, now the largest supplier) booming since 2000. While trade flow statistics between tropical plywood importers and exporters show fewer discrepancies than do primary products like logs and sawnwood, problems obviously remain in the statistics reported by some countries.

Figure 5. Plywood import trends – EU 15



A review and possible simplification of the classification(s) of tropical plywood within the Harmonized System nomenclature of the World Customs Organization used by most countries to track trade in these products would be a useful first step in attempting to address such problems.

Future trends for tropical plywood

- China will continue to expand production and exports but at a slower rate
- Japan will continue to shrink as a (tropical) plywood producer/importer
- EU trade (imports and exports) will continue its downward trend, slowly for imports and probably faster for exports
- Indonesian production and exports will continue to decline, leaving Malaysia as the top tropical plywood exporter
- Brazil will continue to increase coniferous plywood production and trade faster than tropical but will continue to dwarf other Latin American producers
- Africa will continue to increase production and trade from a low base, but growth depends on investment and market access
- New products (artificial laminates, film, wire mesh, combi-ply), softwoods and reconstituted panels (eg OSB) will continue to reduce demand for traditional tropical plywood
- Increased oil and freight costs will put pressure on producers, rebuilding after Hurricane Katrina may have some demand impacts, price rises are likely
- India has market potential but tariffs/duties remain high
- Statistics and lack of market transparency will remain problems

Current situation and prospect for plywood production and trade in China

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Introduction

This article briefly reviews the development of the plywood industry in China and analyzes the current situation of raw material resources, processing and applications as well as the production distribution and foreign trade of plywood products made in China. Since the 1990s, the plywood industry in China has experienced great changes. The main production areas shifted from natural forests to provinces with less natural forests where economies were developing fastest. The raw materials for plywood manufacturing have diversified from unitary, domestic and natural forest species to now include mixed, imported and domestic natural forest species and plantation forest species. Plywood products have also diversified from the common utility products made originally. Foreign trade has changed from general import and export trade into processing trade. China has evolved from a large plywood importer into a large plywood producer and exporter. The development of the plywood industry in China has entered a stable phase but is facing great challenges, such as raw material availability, small enterprise production scale, varied product quality, and competition from thin medium-density fibreboard (MDF). China will strengthen development of plantation forests, maintain a certain amount of tropical timber imports, strengthen technology innovation, stabilize plywood production, and improve product quality and technology.

Historically, plywood has been the leading wood-based panel product in China and has been used mainly in interior decoration, furniture-making, packaging and concrete formworks, etc. In addition to utility plywood, China is also making performance plywood, such as plywood overlaid with sliced veneer (including temperate precious hardwood reconstituted fancy veneer and dyeing veneer), plywood overlaid with impregnated paper for concrete formwork, plywood for container decking, multi-layer plywood for flooring, retardant treatment plywood, plywood for railway passenger carriers, plywood for aviation, plywood for tea packaging, plywood for ping-pong racquets, preservative-treated and insect-proof plywood, plywood for packaging and molded plywood as well as plywood made from bamboo and wood. The plywood is mainly composed of three or five layers bonded with urea-formaldehyde glue. Since large-diameter logs for making plywood are becoming harder to obtain, plywood makers in China are cutting veneers more thinly (up to 0.55 mm thick) from imported tropical wood species (eg *Shorea* spp, *Dipterocarpus* spp, *Aucoumea klaineana* and *Dryobalanops* spp, etc), greatly improving the yield of face veneer. Plywood-makers in China have also put much effort into utilizing local plantation species, such as poplar, pine, rubberwood and eucalypts. Such species are mainly used for core veneer in the production of combi-plywood, which combine imported tropical wood species (face veneer) with local plantation species in the core. In that way, plywood resources in China have been greatly enriched, and more tropical plywood has been supplied to meet the increased demands of international and domestic markets. Generally, the utilization efficiency of wood resources in China for plywood is quite high and due to the unique characteristics in China – fewer wood resources but plentiful cheap labour. More specifically, plywood-makers in China widely use veneer edge technology while peeling, thinner face veneer, core veneer splicing, spindle-less peeling, self-made glue and double assembling, etc. The ability to produce cheap plywood in China is due to several factors, including cheap but hard-working labour, cheap domestically made equipment, cheap self-made adhesives, cheap local plantation timber (such as poplar), and the highly efficient utilization of wood resources. Plywood standards in China mainly refer to the International Standards Organization (ISO) series standard and Japanese standards. Chinese plywood quality has improved and production and exports have increased in recent years, with strong competitive ability in international markets. Thus, Chinese plywood plays a very important role in the world.

Development of plywood industry in China

The Chinese plywood industry originated in the northeast area in the 1920s and basswood and birch were the two main species used. Soybean glues were used for cold pressing, while blood glues were used for hot pressing. Tropical broad-leaved species (Lauan, *Shorea* spp) began to be used for plywood manu-

Figure 6. Plywood production in China during 1990–2004

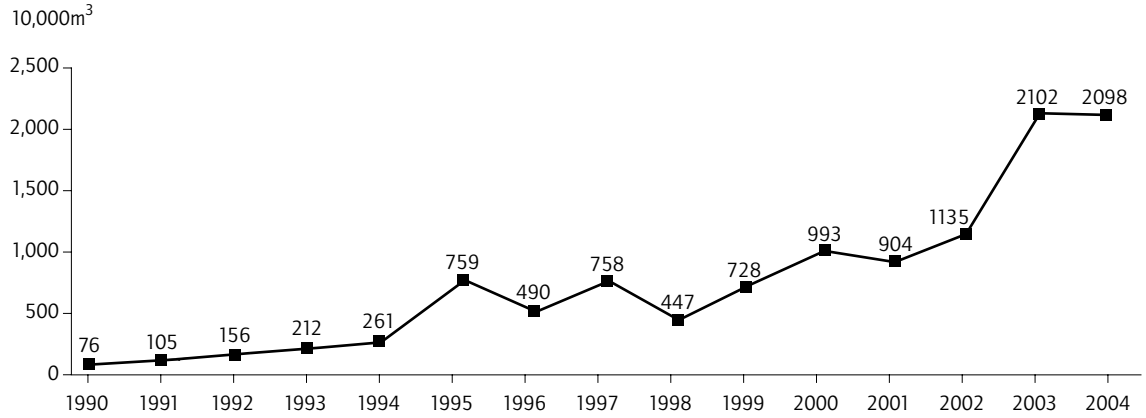


Table 1. Top 20 plywood-producing regions in China, 2003 ('000 m³)

Place	Name of region	Production	Place	Name of region	Production
1	Hebei	5,578.7	11	Hubei	212.2
2	Shandong	4,455.4	12	Guangxi	169.1
3	Jiangsu	3,678.5	13	Inner Mongolia	129.9
4	Zhejiang	2,865.7	14	Yunnan	89.0
5	Guangdong	894.1	15	Jilin	56.8
6	Fujian	783.5	16	Hainan	54.4
7	Anhui	701.5	17	Sichuan	40.6
8	Hunan	574.3	18	Guizhou	31.6
9	Jiangxi	387.7	19	Liaoning	27.9
10	Henan	249.9	20	Helongjiang	21.6

facturing in the 1930s and urea-formaldehyde and phenol formaldehyde adhesives were imported and used from 1948 onwards.

The development of the Chinese plywood industry can be divided into five stages. It took 30 years for the annual production to grow from zero to 35,000 m^3, another 27 years to grow to 329,000 m^3, another ten years to grow to 7,590,000 m^3, eight years further to grow 4,465,000 m^3 and only five years more to grow to an annual production of 21,023,000 m^3 in 2003 at an average increase of 3,304,000 m^3 per year (see Figure 6). Annual plywood production in China in 2004 was 20,986,000 m^3, representing a stable situation, which may last for a long period. At the same time, the foreign plywood trade in China also experienced dramatic changes; China became a large net plywood exporter this century, having been a large net importer in the last century. The volume of plywood exports from China overtook import volumes for the first time in 2001, and the export value of plywood exceeded import value for the first time in 2002. The trend has continued since; the net surplus of export volume and value of plywood made in China reached 3,510,000 m^3 and US$897 million, respectively, in 2004.

Production distribution and output of plywood industry in China

Production distribution

Beginning from 1978, when China started to implement an open-door policy, the plywood industry in China experienced great changes, especially in the last ten years with increased interest from manufacturing enterprises, privately owned enterprises and foreign-invested enterprises. The main production areas shifted from natural forest areas such as Heilongjiang and Jilin to provinces that have not traditionally been important forest-production areas – but which have strong economies – like Hebei, Shandong, Jiangsu, Zhejiang and Guangdong. Plywood production in these provinces reached 17,472,400 m^3 in 2003, comprising 83% of all production in China (see Table 1).

Table 2. Plywood production and wood-based panels production in China ('000 m^3)

Year	Plywood	Fibreboard	Particleboard	Plywood's proportion of total production (%)
1965	139	50	31	63.1
1975	192	155	27	51.3
1980	329	506	78	36.1
1985	539	895	182	33.3
1990	759	1,172	428	32.2
1991	1,054	1,174	613	37.0
1992	1,565	1,445	1,158	37.5
1993	2,125	1,810	1,571	38.6
1994	2,606	1,930	1,682	41.9
1995	7,593	2,164	4,351	53.8
1996	4,903	2,055	3,383	47.4
1997	7,585	2,759	3,604	54.4
1998	4,465	2,195	2,663	47.9
Year	**Plywood**	**Fibreboard**	**Particleboard**	**Plywood's proportion of total production (%)**
1999	7,276	3,906	2,410	53.5
2000	9,925	5,144	2,868	55.3
2001	9,045	5,701	3,445	49.1
2002	11,352	7,674	3,693	50.0
2003	21,023	11,283	5,474	55.6
2004	20,986	15,605	6,429	48.8

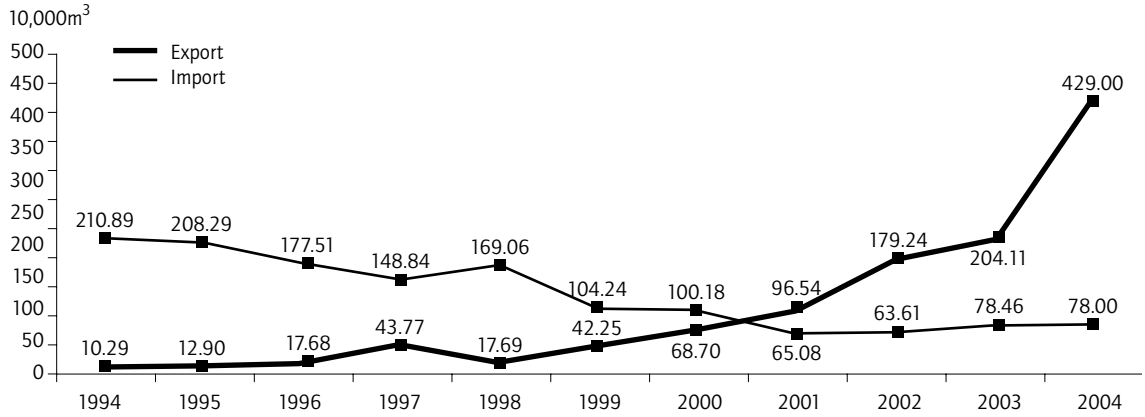
Plywood production

As the oldest product in the wood-based panels' family, plywood has kept its leading position and still commands the biggest share of the market in China (Table 2).

In 1994, when China experienced its strongest economic growth, the output of domestically produced plywood far from met the fast-growing market demand; this led to a large increase in domestically produced plywood, from 2,606,000 m^3 in 1994 to 7,593,000 m^3 in 1995, which was more than 50% of all wood-based panel production in that year. In 1996, plywood smuggling severely hurt the country's plywood industry and led to a dramatic reduction in production. In 1997, the Chinese central government started to take vigorous actions to prevent plywood smuggling and Chinese production began to grow again. In 1998, the plywood price in China fell by 30–40% as a result of the Southeast Asian finance crisis in 1997. Many domestic plywood-producing enterprises in China lost large amounts of money and suspended production or began to make other products, resulting once again in decreased production. In 1999, plywood production rebounded, thanks largely to renewed global economic growth, an increased supply of domestic plantation timber and improved manufacturing technology and product quality. Even though China started to implement its Natural Forest Conservation Program and thus reduced wood production in its northeast in 1998, the plywood industry adapted by developing major plywood products using combinations of local plantation timber and imported timber resources.

At present it is difficult to count the number of plywood enterprises in China. It is estimated that the number of plywood enterprises of a certain scale is around 5,000. The production capacity of most enterprises is less than 10,000 m^3 per year. There are a few medium-scale and large-scale enterprises with production capacities of greater than 20,000 m^3 per year. Most of the medium-scale and large-scale enterprises established in the last ten years are the result of investment by either foreign companies or local

Figure 7. Plywood foreign trade in China in recent years



share-holding companies with higher technical and management levels and better product quality and represent a leading force in and providing development direction for the plywood industry in China.

Plywood foreign trade in China

Foreign trade

Plywood made in China began to be exported in the middle 1990s in general trade mode, which shifted to processing trade in recent years. At present, the export plywood trade is generally characterized by the import of raw materials and the export of processed products. In 2001, plywood processing trade with customer's materials accounted for 50% of total global plywood imports. Veneer processing trade with customer's materials also increased and accounted for 42% of total veneer imports.

The processing trade of plywood in China not only upgrades the industry structure and optimizes plywood product structure, it also creates employment opportunities. A reasonable trade surplus has helped maintain the ability to increase wood and wood imports. But the value added on plywood in processing trade is very low, with the majority of profits left overseas. Moreover, most plywood enterprises involved in the processing trade have to rely on overseas partners' distribution channels and trademarks to indirectly enter international markets. Therefore, plywood made in China has not yet fostered its own real competitive ability in international markets and will occupy the lower end of the value chain if it depends on the processing trade for a long time, which would limit the further development of China's plywood industry.

Foreign trade volume

In the 1990s, plywood imports showed a declining trend, while exports started to increase (Figure 7). Exports started to increase dramatically from 2000 onwards.

Table 3. Foreign trade volume of plywood in China, 2000–2004 ('000 m^3)

Year	Import volume	Compared with last year %	Export volume	Compared with last year %
2000	1,002.8	-3.80	689.8	+63.27
2001	651.4	-35.04	965.5	+39.97
2002	636.1	-2.35	1,792.9	+85.70
2003	784.6	+23.35	2,041.1	+13.84
2004	780.0	-0.59	4,290.9	+110.21

Table 4. Foreign trade value of plywood in China, 2000–2004 (US$'000)

Year	Import value	Compared with last year %	Export value	Compared with last year %
2000	436,838.5	+4.01	188,955.2	+54.85
2001	254,484.8	-41.74	242,440.2	+28.31
2002	258,724.9	+1.67	426,995.1	+76.12
2003	347,357.0	+34.28	495,755.2	+16.10
2004	347,476.4	+0.03	124,474.2	+151.08

Table 5. Foreign trade of plywood made in China in the first quarter of 2005 and 2004

Foreign trade	First quarter in 2005	First quarter in 2004	Changes (%)
Import volume ('000 m^3)	198.892	181.041	+9.86
Export volume ('000 m^3)	1,035.35	667.433	+55.12
Import value (US$'000)	101,470	78,920	+28.12
Export value (US$'000)	340,420	174,060	+95.58

Tables 3, 4 and 5 show that the development of the plywood industry in China has been extremely fast, and that exports continue to grow strongly. Two developments are worthy of further note:

1) plywood production in China exceeded the critical 20 million m^3 volume mark in 2004 and 2005; China has become a large plywood producer. China has also become a large net plywood exporter: plywood export volume and export value were 3,510,000 m^3 and US$897 million (see tables 3 and 4) more than the import volume and import value, respectively, in 2004; and

2) China was a large plywood importer in the 20th century. But, in 2001, China showed for the first time a net export volume – of 314,000 m^3 – and this net export volume has grown since. The volume of plywood exports increased rapidly, to 4.3 million m^3 in 2004, which was 110% the volume in 2003 and 6.2 times that in 2001. In the first half of 2005, the plywood export volume reached 2,683 million m^3, an increase of 38% by volume and 67% by value over 2004. In the first quarter in 2005, plywood export volume and value were 1,035 million m^3 and US$340 million (see Table 5), respectively, increases of 55.1% and almost 100%, respectively, compared to the same period in 2004. China's plywood industry is very large and very strong.

Challenges faced by plywood industry in China

The plywood industry in China has made great progress in recent years and will make more progress in the future. But there are also many difficulties and problems caused by many international and domestic factors.

Restricted resource availability

China has limited forest resources and large-sized diameter logs and broad-leaved species for manufacturing high quality plywood are especially scarce. The implementation of the Natural Forest Conservation Program in 1998 revealed a severe contradiction between supply and demand. China has to import large volumes of timber to meet the demand, both in terms of quantity and species. Along with an increase in global awareness of the need for greater environmental protection, some developed countries have started to require certificates for imported plywood products, which means that tropical plywood-makers must prove that the logs used for making plywood have originated from sustainably managed forests. On the other hand, some tropical timber-producing countries have tried to increase domestic processing of tropical logs to boost economic and social development by limiting or banning the export of logs. As a result, the unit price of imported logs to China were 12.6% higher for conifers and 9.3% higher for broad-leaved species in the first period of 2005 compared to the same period in 2004. Thus, the plywood industry in China is and will face shortages of wood resources and increased costs for raw materials; the competitiveness of the industry will likely be weakened if the industry continues to rely on imported raw material to a large extent.

Small enterprise production scale

At present, the production scale of most plywood enterprises in China is small, although some large- and medium-scale enterprises have been established. The large and medium-sized plywood production enterprises are managed with international practice, and some are listed on China's stock exchange. But the majority of small-sized plywood production enterprises are managed with low profits, out-of-date technology and equipment, and a low capacity for innovation. These small enterprises are far behind developed countries in many aspects, including product quality control, energy consumption, productivity, air and noise pollution, dust and sewage.

Varied quality of plywood products

The means of quality control in many Chinese plywood enterprises is not advanced, resulting in high formaldehyde emissions and big variations in the dimensions of products. Adhesives used for plywood

manufacturing are generally self-made, low-cost, and high in formaldehyde emissions. Both international and domestic markets are paying increasing attention to formaldehyde emissions and the need to reduce them to meet stricter requirements; this is a challenge for China's plywood industry, not only for continuing to enlarge exports but also to maintain market share in the domestic wood-based panels market.

Strong competition from thin MDF

Thin MDF has developed very quickly in China in recent years and is widely used in interior decoration and gift packaging, which are traditional applications of plywood in China. Plywood continues to enjoy some advantages over MDF, such as natural beauty, lower capital requirements, easy handling and cheap employment and the domestic market has continued to grow. However, the competition between plywood and MDF is likely to increase, and only time will tell how big an impact it will have on the plywood industry.

Prospects for the plywood industry in China

To increase domestic tropical timber supply by developing more plantation forests, such as rubberwood, teak and Eucalyptus*, to maintain certain amount of tropical wood imports and to strengthen technology innovations*

Given growing concern internationally about environment protection and sustainable forest development, as well as continued wood-processing development in tropical timber-producing countries, the supply of high-quality broadleaf log imports for plywood manufacturing is likely to gradually decline. In order to ensure an adequate wood supply for its plywood industry, China will continue its efforts to develop more and better tropical plantation forests (such as rubber trees, teak and *Eucalyptus*), to maintain certain amount of tropical timber imports, and to strengthen technology innovation. China has successfully developed technologies for making reconstituted fancy veneer from plantation timber. This product is widely used not only in overlaying wood-based panels but also for furniture making, interior decoration, sporting apparatus manufacturing and handicrafts, etc, to partly substitute imported broadleaf materials from natural forests. This technology has already been extended to wood industries and provided remarkable social and economic benefits.

To strengthen quality consciousness

ISO 9000 series quality management is widely known in China's wood industries and is considered an effective tool for breaking through trade barriers, improving product quality and popularity, reducing production cost, increasing economic benefits and maintaining consumer rights. Certification based on ISO 9000 series quality management has become a basic requirement for a plywood manufacturing company that wants to export its plywood products. One of the most effective and direct ways for the Chinese plywood enterprises to obtain 'green passes' in both international and domestic markets is to obtain the ISO 9000 series quality management certification. The Chinese government has been promoting quality improvement by implementing the Quality Management Act and taking a series of actions, such as setting ISO 9000 series quality certification as a precondition for producer qualification in programs such as 'Famous Brand Strategy', 'Products Inspection Exempt', 'Government Purchasing Procurement' and 'Project Bidding', etc, to promote ISO 9000 series quality management in Chinese industries. Many Chinese plywood manufacturers are now certified or are in the process of becoming certified.

To strengthen environmental awareness

The Chinese government has been paying considerable attention to global ecological issues and has developed public awareness campaigns, guidelines and support for environmental protection. At the same time, the environmental protection awareness of Chinese plywood enterprises has been strengthened gradually. The number of enterprises certified with ISO 14000 series environmental management systems has increased rapidly in recent years, from only four in 1996 to more than 1,000 in 2001 and more than 2,000 in 2002. Being widely used in interior decoration, plywood products are closely linked with people's living conditions and health. Therefore, implementing an ISO14000 series environmental management system is a requirement not only for environmental protection and improving human health, but also for an enterprise's own development and its social responsibility. Moreover, since ISO 14000 certification has become a 'green pass' for entering international markets, promoting it is helpful to the international competitiveness of Chinese plywood enterprises. It is understood that Chinese plywood enterprises should strengthen their own environmental awareness but that this will increase production and management costs. All concerned parties should have a clear understanding on this issue.

Forest certification has become one of the hot points for both the Chinese government and the country's forest industries. Under the joint efforts of the State Forestry Administration, the Chinese Academy of Forestry and the China office of the World Wildlife Fund, a forest certification working group was established in Beijing in May 2001 and a leading group in charge of forest certification in China was set up by the State Forestry Administration in July 2001. The leading group is responsible for coordinating the establishment of index and system standards of forest certification, making forest certification policy, and studying the establishment and operation of forest certification organizations in China. In February 2002, the Changhua forest farm of Zhejiang Province became the first certified forest operation in China. An additional 240,000 hectares of forests in the Youhao Forestry Bureau of Heilongjiang Province and 180,000 hectares of forests in the Baihe Forestry Bureau of Jilin Province were evaluated against the Forest Stewardship Council (FSC) principles and criteria in November 2004. Meanwhile, some plywood manufacturing enterprises in China started to implement FSC production and sales monitoring chains to meet the needs of the international market.

It is a reasonable demand of the international and domestic markets that Chinese enterprises gradually strengthen their environmental performance by adopting ISO 14000 series environmental management systems and forest certification. China is still a developing country with many small plywood enterprises. Production technology and management are far behind developed countries. Chinese plywood production enterprises ought to upgrade their technology and management to meet international market demands. Plywood importers should also allow Chinese plywood enterprises more time to develop. It is not acceptable to set up a non-tariff barrier to Chinese plywood products, based on World Trade Organization (WTO) regulations.

To establish international coordination mechanism

After China joined the WTO, the export environment for Chinese plywood products changed greatly and exports of Chinese plywood grew rapidly. This has helped the plywood industry in China to adjust its production structure and to improve management and resource utilization efficiency. On the other hand, Chinese plywood exports have increased dramatically in the last few years and given rise to non-tariff barriers, such as levying an anti-dumping tax on Chinese plywood, etc, which create new difficulties for the Chinese plywood industry.

China has always paid great attention to its own responsibility and image in the international community as one of the big timber importers and has a firm position against illegal logging and illegal trading. The Chinese government has established multilateral and bilateral exchange and cooperation relationships with relevant countries. For example, China signed a memorandum of understanding (MOU) with the Government of Indonesia to combat illegal logging and illegal trading and has also established cooperation on SFM with Russia and Burma, etc. The Chinese government also requires that Chinese enterprises with overseas logging operations adhere strictly to the laws and regulations of the resource countries governing logging, replanting and processing practice. The 'International Seminar on Cooperative Dialogue of Forests in China' was organized by the State Forestry Administration, the Chinese Academy of Forestry, the World Bank and FAO and held in Beijing in August 2005, focusing on the impact of international environmental protection on timber imports and wood product exports. A new dialogue mechanism needs to be established between China, the main timber producers and the main wood product importers in order to develop a harmonious cooperative relationship regarding relevant issues, create a more peaceful market environment, and promote legal, fair and equal trade among tropical timber producers, tropical timber product manufacturers and wood product importers. All the countries concerned should take more responsibility, meet their obligations and make joint efforts to realize the goal of 'win-win'. That means that tropical timber producers should strengthen the sustainable management of their forests, tropical timber product manufacturers should strengthen the development of plantation forests and improve plywood quality, and developed countries should provide more technical and financial support to the sustainable management of tropical forests.

Conclusions

The development of the plywood industry in China has entered a stable phase but is facing great challenges, such as raw material availability, small enterprise scale, variable product quality and competition from thin MDF. The Chinese plywood industry will continue to make full use of its comparative advantage and to improve its attention to product quality and environ-

mental protection. It is expected that plywood product quality and technology levels will improve rapidly. A new international dialogue mechanism among tropical timber producers, tropical wood product makers and tropical wood product importers should be established to promote the healthy and harmonious development of the global tropical plywood sector.

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Trends in production and trade in tropical plywood in Asia

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In this paper, 'Asia' is taken to encompass Russia, East Asia (including India), and Asia Pacific. One of the challenges in addressing this topic lies in getting reliable trade data for the region. The statistics presented here were compiled by several international organizations, especially ITTO, which has the most comprehensive data on the trade of tropical timber.

Introduction

During the last decade the international trade of tropical plywood has been characterized by rapid and dynamic changes, particularly in the Asian region. The region, led by Indonesia and Malaysia, produces close to 90% of the world production of tropical plywood. Similarly, Asia also accounts for 72% of total tropical plywood imports, with Japan and Korea being the world's two largest importers of tropical plywood.

Production

Asia produces almost 90% of the world's total tropical plywood production. However, production in Asia has more-or-less stabilized since the rapid growth recorded in mid 1980s. In 2001 and 2002, plywood production totaled 17.5 million m^3 and 17.4 million m^3 respectively. This total rose significantly to 19.2 million m^3 in 2004 (tables 6 and 7); increased production from Malaysia and China was the main reason for the increase.

Table 6. Production trends of tropical plywood

'000 m^3	2000	2001	2002	2003	2004
Total tropical	20,897	19,740	19,491	21,392	21,457
Asia	18,785	17,541	17,371	19,164	19,204
%	89.9%	88.9%	89.1%	89.6%	89.5%

The production of tropical plywood has typically been led by Indonesia and Malaysia. Production in Indonesia, however, dropped to 6.4 million m^3 in 2004, a far cry from the 8.2 million m^3 and 7.3 million m^3 recorded in 2000 and 2001, respectively. Due to the efforts of government to crack down on illegal logging and enforce stricter controls on the illegal timber trade, plywood mills in Indonesia have been having problems in getting adequate as well as consistent log supply. Production dropped as a result.

Table 7. Production trends of tropical plywood in some Asian countries

'000 m^3	2000	2001	2002	2003	2004
Indonesia	8,200	7,300	6,550	6,740	6,400
Malaysia	4,434	4,318	4,341	4,771	4,900
China	1,800	2,200	3,000	4,000	4,400
India	1,300	1,300	1,600	1,760	1,760
Japan	1,660	1,110	800	750	625

For Malaysia, production has stabilized since the initial expansion in the early 1990s. Plywood production reached 4.9 million m^3 in 2004, a slight improvement on the 4.7 million m^3 produced in 2003. Increased demand from the US and Japan due to active housing markets, as well as improved prices, were the reasons for the higher production.

While production has stabilized in Malaysia and declined in Indonesia, the growth of the Chinese plywood industry has been most remarkable. China's production of tropical plywood reached 4.4 million m^3 in 2004, up from 1.8 million m^3 in 2000.

While global tropical plywood production is dominated by Indonesia, Malaysia and China, which together accounted for 72% of the world's total, other significant Asian producers are India and Japan, which produced 1.76 million m^3 and 625,000 m^3, respectively, in 2004. However, production from these two countries is mainly used locally.

Imports

As well as being a major producer of tropical plywood, Asia's role as a major importing region of the product is equally significant. In 2004, imports of tropical plywood by Asia totaled 7.77 million m^3, accounting for 72% of the total trade (Table 8) and representing a 29% increase over the 6 million m^3 recorded in 2003. Japan, China and Taiwan Province of China all increased their imports.

Japan is the largest market for tropical plywood in Asia and also globally. In 2004, with a total import of 4.6 million m^3, Japan accounted for 60% of the total tropical plywood import volume in Asia and 43% of the world total. Japan's 2004 imports was a sharp increase from the 3.3 million m^3 it registered in 2003. The higher import volume was due mainly to

a firmer housing market and cheaper plywood imports. The domestic production of tropical plywood in Japan has declined as the supply of tropical logs has become increasingly restricted. Rising log demand in India and China kept both demand for and prices of tropical logs firm.

Table 8. Import trends of tropical plywood

'000 m^3	2000	2001	2002	2003	2004
Total tropical	11,031	10,502	10,181	8,921	10,729
Asia	7,484	6,990	7,291	6,020	7,766
%	67.8%	66.5%	71.6%	67.5%	72.4%

Korea also plays a significant role in the global trade of tropical plywood. Imports by that market have grown steadily from around 902,000 m^3 in 2000 to 1.35 million m^3 in 2004. Korea was the second-largest importer of tropical plywood in that year, accounting for 17% of Asia's total and 12% of the world total (Table 9).

Table 9. Import trends of tropical plywood in some Asian countries

'000 m^3	2000	2001	2002	2003	2004
Japan	4,555	4,529	4,631	3,295	4,615
Korea	902	1,022	1,234	1,331	1,346
China	905	619	582	409	673
Hong Kong	407	306	245	271	333
Taiwan Province of China	620	406	483	558	639

Imports of tropical plywood into China are still substantial, although the country is now a net exporter. In 2004, China imported 673,000 m^3 of tropical plywood, ranking third among Asian markets, but this was far below the level it was importing in the 1990s. With Taiwan Province of China and Hong Kong reporting imports of 639,000 m^3 and 333,000 m^3, respectively, in 2004, the Far East region is obviously the key market for tropical plywood, accounting for close to 98% of the total tropical plywood market in Asia and 70% of the world total.

Exports

As a major producer, Asia accounts for 85% of the world's total tropical plywood exports. In 2004, Asia exported 11 million m^3 out of a world total of 12.9 million m^3, a significant increase over the 9.7 million m^3 exported in both 2003 and 2004 (Table 10). Higher demand from the US and Japan boosted exports from Indonesia, Malaysia and China.

Table 10. Export trends of tropical plywood

'000 m^3	2000	2001	2002	2003	2004
Total Tropical	13,062	11,451	11,360	11,393	12,921
Asia	11,472	9,886	9,751	9,730	11,017
%	87.8%	86.3%	85.8%	85.4%	85.2%

Currently, exports of tropical plywood are dominated by Indonesia and Malaysia, with the former still leading. In 2004, exports from Indonesia totaled 5.5 million m^3, or 43% of the total tropical plywood trade, a sharp drop from the 7–8 million m^3 it exported in 2000. Plywood exports from Indonesia have been declining since 2001, from about 6 million m^3 then to 5 million m^3 in 2003 (Table 11). Declining log supply has been the main reason for reduced production and exports.

Table 11. Export trends of tropical plywood in some Asian countries

'000 m^3	2000	2001	2002	2003	2004
Indonesia	7,768	6,003	5,520	5,092	5,500
Malaysia	3,420	3,517	3,614	3,875	4,274
China	129	190	437	567	955
India	2	64	59	61	113

Plywood exports from Malaysia, on the other hand, increased from 3.6 million m^3 in 2002 to 3.9 million m^3 in 2003 and by a further 10% to 4.3 million m^3 in 2004. Plywood production in Malaysia is done mostly in Sabah and Sarawak, as the timber industry in those two states has focused mainly on the processing of logs into plywood and account for about 95% of the country's total production.

The emerging role of China as a major exporter of plywood is worthy of mention. The exponential growth of its plywood industry in terms of production volume and exports is remarkable. From a net importer of plywood, China currently ranks in the world's top three exporters of tropical plywood along with Indonesia and Malaysia. In 2004, plywood exports from China reached 955,000 m^3, up from about 200,000 m^3 in 2001.

Future trends in production and trade

Having outlined the current status of production and trade in tropical plywood, we now discuss the likely future trends. For example, will production continue to rise in the phenomenal way it did in the early 1990s?

In this regard, one of the most pertinent issues facing tropical plywood producers is the supply of logs. Declining forest availability due to past indiscriminate logging and stricter controls on harvesting have already impacted on the supply of tropical logs to the plywood processing industry.

In Indonesia, plywood mills have been badly affected by the government's policy of reducing the log harvest. The Indonesian government is expected to continue exercising stricter control on harvesting, and, as a result, log supply will remain restricted in the future. Similarly, log production in Malaysia has also declined. Production currently totals around 22 million m^3, compared to 30 million m^3 in the mid 1990s.

With lower log production and increased domestic processing, log exports from Malaysia (Sarawak), the main exporter of tropical logs, are expected to decline further. Plywood manufacturing, especially in Japan and China, which are dependent on tropical logs from Malaysia, will be affected. As it is, an increasing number of plywood mills in Japan are shifting to softwoods in their plywood manufacturing. Plywood mills in China are using their own plantation timbers as core and imported tropical wood as face.

The challenge for tropical plywood producers, therefore, lies in the efficient use of the scarce resources. Manufacturers have been looking to improved technology and production efficiency to achieve a better recovery of the wood.

To address the issue of log supply, many governments in Asia, namely China, Japan, Indonesia, Malaysia and Thailand, have initiated the development of large-scale forest plantations. A large-scale forest plantation development program is in the pipeline in Malaysia, even though the country still boasts a forest area of 19.52 million hectares, or 59.5% of its total land area. It is expected that forest plantations will play a significant role in the supply of wood there in the future. Besides plantation timbers, research into the development of other fibre materials, including the use of oil palm trunks, is also being undertaken.

As the supply of tropical timber declines, prices for tropical plywood are expected to remain higher than those for similar products such as softwood plywood and reconstituted panels. The increased production and use of reconstituted panels such as fibreboard are expected to pose further challenges to producers and exporters of tropical plywood. The trade liberalization and globalization process will facilitate the freer movement of products and encourage substitution.

From a trade perspective, the uncertainty of supply as well as higher prices will affect demand. Effective marketing will be necessary if tropical plywood producers are to maintain their market share.

The Far East region, led by Japan and Korea, will likely remain the major consumer and importer of tropical plywood. However, India is also a prospective market that tropical plywood producers are eagerly exploring. With its large population and strong economic growth, India will be a potentially large market for timber products, including tropical plywood. In addition, India is now in the process of liberalizing its domestic market. Negotiations with a few major trading partners including the Association of South East Asian Nations for a free trade agreement have started. With the conclusion of these trade agreements, imports into India will enjoy easier access.

Conclusion

The production of tropical plywood is expected to be maintained, with Indonesia, Malaysia and China (maybe not be in this order of ranking) still the major exporters. Plywood manufacturing will still be the mainstay of the timber industry in both Indonesia, Malaysia and, to a certain extent, China. Restrained by the lower production of tropical logs, the market may not see growth in tropical plywood as spectacular as that seen in the market previously, but production will increasingly move towards value-added and specialized products for niche markets.

Production and trade of tropical plywood in Latin America: present status and outlook

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Introduction

Although several Latin American countries produce tropical plywood, three countries (Brazil, Ecuador and Peru) are responsible for more than 90% of total regional production. Latin American production of tropical plywood is relatively small compared to Asian operations. The region produces around 1,600,000 m³ of tropical plywood per year (2004) and contributes only 2.6% of total global production. An important share (around 50%) of the total production is consumed by local markets. Exports are mainly to North America and Europe.

In recent years the business climate has changed for the Latin American tropical plywood industry. Increasing transaction costs, unclear regulations, especially regarding access to raw material, poor law enforcement and other problems are reducing investments in the sector. As a result, no significant expansion of tropical plywood production is expected in coming years, and the industry of Latin America is expected to lose market share to plywood produced from temperate species and to other wood panels.

Latin America has a land area of around 16.3 million km^2 and a total population of about 550 million people. The region is rich in natural resources, many still to be developed; its forests represent 25% of the total global forest resource.

Plantation wood will gradually replace timber from natural tropical forest. The tropical plywood industry of Latin America is starting to invest in forest plantations to ensure future wood supply and reduce costs. It will be necessary to adjust technology and equipment to the new raw material (small-diameter logs), but this should help to improve the competitiveness of the tropical timber industry in the future.

The forest industry is an important economic sector in several countries in the region. Investments in the region's forest sector in recent years have increased its production and competitiveness in the global market. It is quite diversified. It exports pulp, paper and a large variety of solid and value-added wood products. Tropical natural forests are an important source of raw material, but plantations (mainly in temperate parts of the region) have gained importance in recent years and are now the main source of raw material for the industry.

Tropical plywood production is an important economic activity in several countries of the region. A significant portion of the production is traded in local markets, but exports have increased and the region's tropical plywood industry has gained market share in recent years.

This paper presents a review of recent development in the tropical plywood industry in Latin America. It also discusses the implications of recent changes in the sectorial investment climate for the tropical timber industry in general, and the prospects for the region's tropical plywood industry.

Tropical forests in Latin America

Natural forests

Latin America contains a large portion of the global tropical forest estate. In total, the region has around 909 million hectares of tropical forests, mostly in the Amazon, representing more than 50% of the total remaining global tropical forests.

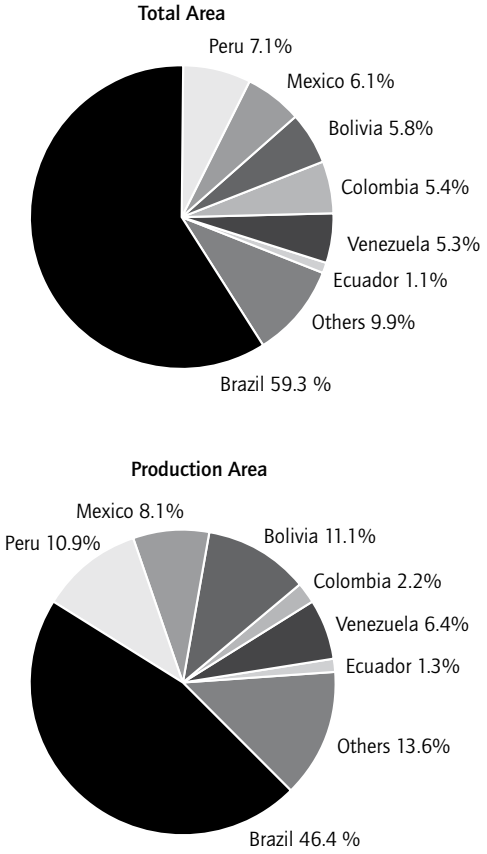
Table 12 shows forest areas for some of the countries of the region. Brazil has the largest share, with 59% of the regional total. Other countries with large tropical forest areas are Peru (7.1%), Mexico (6.1%), Bolivia (5.8%), Colombia (5.4%) and Venezuela (5.3%).

Table 12. Natural tropical forests in Latin America

Country	Total area ('000 hectares)	Production area ('000 hectares)
Brazil	538,747	120,000
Peru	64,575	28,300
Mexico	55,200	20,976
Bolivia	53,022	28,800
Colombia	49,460	5,596
Venezuela	48,643	16,500
Ecuador	10,390	3,420
Others	88,885	35,142
Total	908,922	258,734

Source: Adapted by the author from FAO 2004

Figure 8. Natural forest area – country share



Not all existing tropical forest areas are accessible to the industry. Some large forested areas are fully protected, and others have limitations on their use due to physical inaccessibility and other reasons. There are also areas that are poor in terms of commercial species, or with volumes that are too low for an economically viable operation. It is estimated that out of the total tropical natural forest of the region (909 million hectares), only around 259 million hectares, or 28% of the total, are legally and economically accessible (or can be effectively considered as production forests).

The percentage varies among countries (Figure 8). Colombia and Venezuela both have a very large portion set aside for protection. Availability is of course very much linked to government polices and priorities related to forest designations; it would seem that use of the forest for economic development is not a priority in most countries.

Plantations

Table 13 gives estimates of forest plantation area in Latin America. The total existing tropical plantation estate is estimated to be around 6.7 million hectares. This includes areas planted with native species and also exotics such as pines and eucalypts (which are, in fact, the large majority of all plantations). Other important species used for forest plantation in Latin America are teak (*Tectona grandis*), acacia (*Acacia mangium*) and parica or pachaco (*Schizolobium parahybum*).

Most of Latin America's tropical forest plantations are located in Brazil, Venezuela, Peru and Mexico, with Brazil's plantations alone accounting for 67% of the total. Nevertheless, the total area of planted forest in the Latin American tropics is small compared to total tropical forest area, regardless of country. In total, tropical forest plantations make up only 0.7% of the total tropical forest area and 2.6% of the total production tropical forest area in the region.

Table 13. Tropical forest plantations in Latin America

Country	Plantation area ('000 hectares)
Brazil	4,500
Venezuela	863
Peru	640
Mexico	267
Ecuador	167
Colombia	141
Bolivia	46
Others	39
Total	6,663

Source: Adapted by the author from FAO 2004

Wood supply and the plywood industry

Currently, almost all the logs used by the tropical plywood industry come from natural forests. In some countries, such as Brazil and Ecuador, the tropical plywood industry is moving slowly towards plantations, but the share of plantation wood is still very small (probably well under 1%) and will remain small at least in the current decade.

Making supply requirements compatible with SFM has not been an easy task for the Latin American tropical plywood industry. The tropical forests are generally very heterogeneous and most of the harvestable volume is concentrated in species with high wood density, which are not suitable for plywood production. The low volume of logs suitable for plywood increases harvesting costs. The high variability also causes technical problems, increases industrial costs and creates market limitations. All this has contributed to making the product less competitive in the market and reducing profit margins.

An analysis of information on forest management plans in Brazil gives an indication of the problem. The total allowable removal of natural forests under sustainable management is considered to be between 20 and 30 m³/hectare. Of this volume, less than 8 m³ is in the group of species that can be used for plywood and even that includes a relatively large number of species. Currently it is quite common to find 15 species in a plywood mill production line, but there are cases where the number can be even higher – up to 30. The situation is not very different in other countries in the region.

Latin American tropical plywood industry

Industry development

The plywood industry in Latin America started after World War I. The first mills were established in Brazil and expanded in the 1940s, taking advantage of the high-quality Parana pine found in the forests of southern Brazil; the tropical plywood industry started later. The first tropical plywood mills probably started operation in the late 1950s in Colombia and Brazil, but it really only became an important industry during the 1960s.

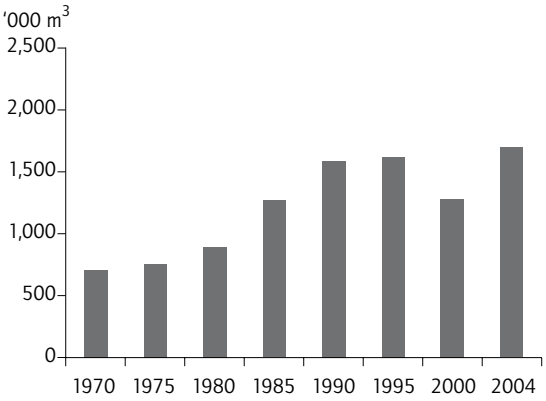
Today, tropical plywood is produced in most tropical Latin American countries, although in many the volume produced is very small. The technological state and size of the mills vary among countries, but in general production is based largely on small operations with low technology. Exceptions are found mostly in Ecuador and Brazil. This makes the Latin American tropical plywood industry quite different from that found in Asia, where larger mills and modern technology are frequently found.

Production and main producing countries

Figure 9 shows the historical growth of tropical plywood production in Latin America. In 1970, total production was 710,000 m³. In 2004, it had grown to around 1.7 million m³, an increase of 139% over the period, representing an average growth of 2.74% per year.

This is a relatively small increase when compared with other wood panels and even with global tropical plywood production over the period. Thus, the tropical plywood industry in the Latin America has fallen behind the development of the wood-panel industry in other parts of the world and has lost market share.

Figure 9. Tropical plywood industry production in Latin America (1970–2004)



Source: FAO/ITTO

Brazil is by far the largest producer of tropical plywood in Latin America, followed by Ecuador, Peru and Colombia. Jointly, these countries are responsible for around 95% of the total tropical plywood production in the region. Estimates of the production of the larger producing countries are presented in Table 14.

Table 14. Main tropical plywood producers in Latin America (2004)

Country	Volume ('000 m³)	Share (%)
Brazil	1,380	81.4
Ecuador	100	5.9
Peru	90	5.3
Colombia	45	2.7
Guyana	40	2.4
Venezuela	12	0.7
Others	29	1.6
Total	1,696	100.0

Sources: FAO 2004, ITTO 2004, STCP unpublished

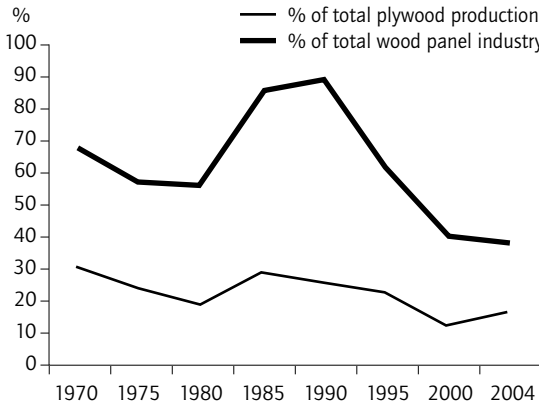
Recent changes in the Latin American wood-panel industry

The wood-panel industry in Latin America has seen enormous changes in recent years. In the late 1990s, Chile, Brazil, Ecuador, Argentina, Venezuela and other countries established several new lines of reconstituted wood panels (particle board, MDF and OSB). In Chile and Brazil, large expansions also took place in the pine plywood industry.

On the other hand, the regional tropical plywood industry has not been so active and, in fact, few investments have been made in recent years to upgrade mills, introduce new technologies and expand production.

As a result of this difference, tropical plywood has lost market share in recent years. Figure 10 shows that in 1970 a large portion of the plywood produced in the region was tropical (some Parana pine plywood was still being produced in southern Brazil at that time). Currently, tropical plywood accounts for around 40% of total plywood production in the region. In terms of total wood-panel production, tropical plywood represented 30% in the 1970s compared to 16% in 2004.

Figure 10. Tropical plywood and other wood-panel production in Latin America



Sources: FAO 2004, ITTO 2000, STCP unpublished

Brazil has made an important contribution to the recent changes in the Latin American plywood industry. The rapid recent growth of pine plywood in Brazil was mainly a result of an increase in the supply of pine logs from plantations. These plantations in the southern part of the country, mostly established in the 1970s, made significant volumes of large-diameter logs available in the 1990s at a relatively low cost. The Brazilian plywood industry thus shifted towards pine plywood and reduced its share of tropical plywood production. In 2004, pine plywood production in Brazil reached 2.4 million m³, which was 64% of total national production and 56% of the total Latin American production.

There are several reasons for the recent changes in the plywood industry of the region. In the case of Brazil, the industry realized that operating with plantation wood, or combining plantation with tropical timber (combi-ply), was important for increasing competitiveness and gaining new markets. Moreover, the industry noticed that there was a better investment climate for plantation wood and that legal constraints and the cost of transactions were lower.

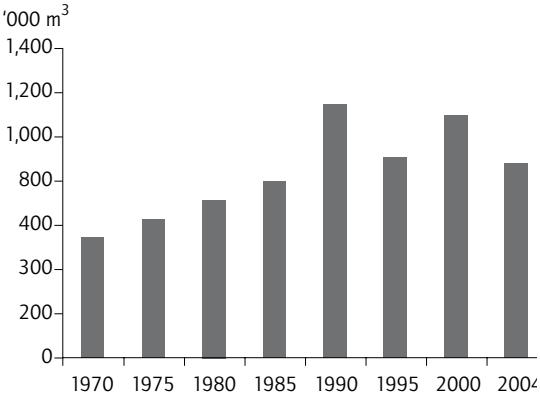
Latin American tropical plywood trade

Domestic consumption

Latin America is a relatively large market for wood products. Some countries, like Mexico and Brazil, have large populations and for many years the timber industry relied largely on domestic markets for most of their trade.

Figure 11 shows estimated historical consumption of tropical plywood in the region. In 1970, the total consumption of tropical plywood in Latin America was about 550,000 m³. Current consumption (2004) is estimated to be around 900,000 m³, a growth of 64% over the period. This increase is equivalent to growth of 1.5% per year, much lower than the average for total wood product consumption in the region.

Figure 11. Consumption of tropical plywood in Latin America (1970–2004)



Sources: ITTO 2004, STCP unpublished

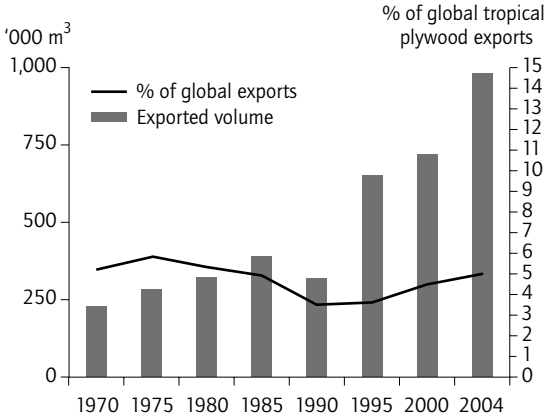
The main consumers of tropical plywood in the region are Brazil, Mexico, Peru, Colombia, Ecuador and Venezuela. Together, these countries account for around 97% of the region's total consumption.

Exports

Figure 12 presents information on tropical plywood exports from Latin America. In 1970, the region exported around 260,000 m³ and in 2004 approximately 1.1 million m³. This represented a fourfold increase during the period, or about 4.4% per year.

Over the years, Latin American tropical plywood producers have never had a large share of international trade. In 1970, the region provided about 5.2% of the global export total. In 1990, this participation had decreased to 3.5%, increasing again by 2004 to around 5%. The latest increase in market share took place after the reduction of production in Asia (mainly Indonesia) due to the 1997 financial crisis.

Figure 12. Latin American tropical plywood exports



Sources: FAO 2004, ITTO 2000, STCP unpublished

The main Latin American tropical plywood exporting countries are Brazil, Ecuador and Guyana (Table 12). Together, these three are responsible for over 98% of the region's current tropical plywood exports.

The estimates of tropical plywood exports by country presented in Table 15 show the continued dominance of Ecuador and especially Brazil. Guyana is a new player.

Table 15. Latin American tropical plywood exports, by country

Country	Volume ('000 m³)				% of total (2004)
	1970	1980	1990	2004	
Brazil	226	289	300	966	88.9
Ecuador	22	48	36	70	6.4
Colombia	0	0	1	4	0.4
Guyana	5	12	9	35	3.2
Mexico	0	1	3	6	0.6
Guatemala	0	0	0	5	0.5
Others	7	10	8	1	0
Total	260	360	357	1,087	100.0

Sources: ITTO 2004, STCP unpublished

Regional trade has been important for some Latin American tropical plywood-exporting countries. A large portion (around 85%t) of Ecuador's tropical plywood exports goes to South and Central American countries and the Caribbean. Brazilian exports are mostly oriented towards Europe and the US, but Caribbean countries have also been an important market.

Market prices

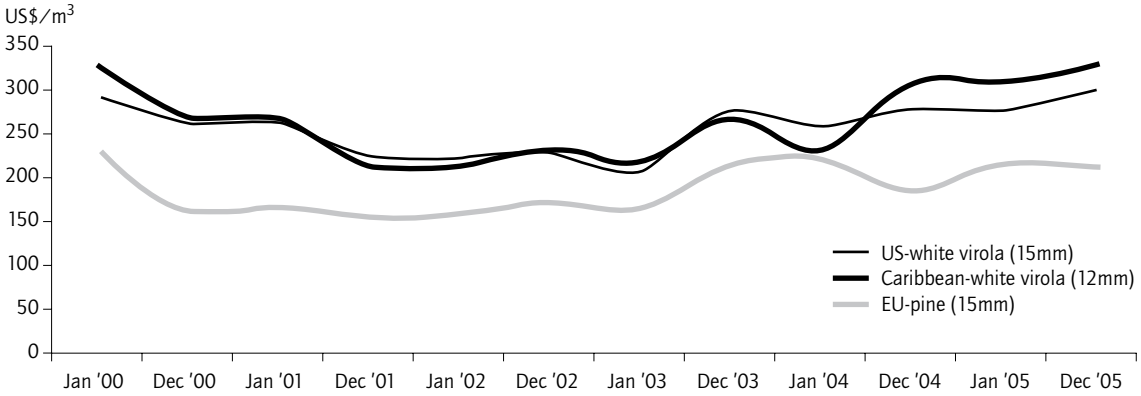
Tropical plywood produced in Latin America has a reputation for been traded in the international market at a lower price than Asian plywood. In fact, this is not quite correct, as the products are different in quality and dimensions and are traded in different markets. Therefore, prices are difficult to compare.

Figure 13 gives estimated prices for Brazilian export plywood (tropical and pine). Prices have varied significantly over the last five years.

This of course is not unique to Brazilian or Latin American plywood. An analysis carried out by the author shows that the region's prices, as expected, followed the same price trend as the overall international market. The lowest prices occurred between late 2001 and early 2003. In this period, free-on-board (FOB) prices of 15 mm tropical plywood panels varied between US$210 and US$230/m³. Current prices are between US$310 and US$330/m³ (an increase of more than 40% in the last two-and-a-half years).

Figure 13 also shows that pine plywood was the same price as tropical plywood in early 2005. This was unusual, especially considering that pine plywood exported from Brazil is construction grade, which is much lower in quality than tropical plywood. In any case, this explains the movement of Brazilian plywood industry towards pine plywood in the last 2–3 years and the abrupt increase in pine plywood exports in 2004.

Figure 13. Export prices of plywood from Brazil to select regions



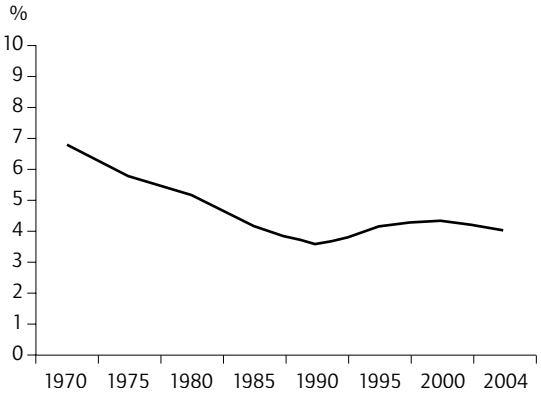
Recent market and trade changes

Latin American tropical plywood producers have made efforts to gain new markets, but the task has not been easy. Competition from traditional Asian producers (mainly Indonesia and Malaysia) has limited the penetration of Latin American tropical plywood in important Asian markets. In the last few years, Chinese tropical plywood (especially combi-ply) has taken market share in Europe, the US and even in smaller markets such as the Caribbean.

Tropical plywood producers face difficulties competing with non-tropical plywood and other wood-based panels. In view of this, and also taking into consideration the availability of alternative competitive wood supplies and increasing limitations imposed on the use of natural tropical forest logs, many traditional producers of tropical plywood have gradually diverted to other products and markets.

Figure 14 shows the decrease in the share of tropical plywood exports from the Latin American region. In the 1970s, most of the plywood exported (around 70%) by Latin American countries was tropical. Currently, the share of tropical plywood of total plywood exported by the region is less than 40%. Still, it has to be considered that the volume registered as tropical plywood includes products such as combi-ply and twin panels. Although exported as tropical plywood, these panels are composed largely of temperate timbers (mostly pine from plantations).

Figure 14. Change in the share of tropical plywood exports by Latin America



Sources: ITTO/FAO, STCP unpublished

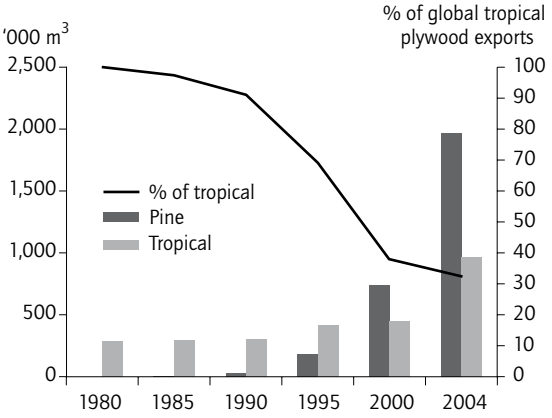
Most of the change in the region's export pattern presented in Figure 15 is in fact an effect of changes and expansions in Brazil and new production in Chile. Both countries have developed a new plywood industry based on pine wood from plantations.

In Brazil, large quantities of veneer logs from pine plantations started to enter the market in the early 1990s. The relatively good quality of the logs, and especially the low price of this new raw material, caused many plywood mills located in the south to divert to pine plywood. New players also entered the business and the pine plywood industry expanded rapidly.

Figure 15 shows the effect on exports of the new plywood industry based on pine in Brazil. In the early 1980s practically no pine plywood was exported. Exports of this product started in the 1990s and in 2004 had reached 1.97 million m³, which is 67% of the total plywood exported by Brazil in that year.

The large majority of the pine plywood exported by Brazil is construction grade and goes to Europe and the US. Smaller volumes are exported to Caribbean countries. Entering and gaining a share of traditional pine plywood markets was quite a challenge for Brazilian producers, and many trade barriers had to be surmounted. Nevertheless, Brazilian pine plywood has gradually replaced pine plywood imported from the US and Canada by European countries.

Figure 15. Recent changes in Brazil plywood exports



Sources: FAO 2004, ITTO 2000, STCP unpublished

No doubt these changes in the market focus by the Latin American plywood industry took place mainly because a low-cost raw material was available and an attractive market was identified for the product, initially in Europe. But there were also other reasons why the tropical plywood industry decided to gradually change to another raw material and consequently to new markets. These included:

- growing market impediments, mainly associated with environment issues affecting the tropical plywood business;

- industrial technology developments that made it possible to use small-diameter and lower-quality logs; and
- product and finishing technology developments.

Trends and perspectives

The general investment climate in Latin America has improved in recent years. Most countries of the region have gone through structural economic and fiscal reforms; these led to reduced inflation and government debt and contributed to increased domestic and international direct investments, all of which helped the countries to enter a new cycle of economic growth.

However, this scenario does not generally apply to the tropical forest industry. In most countries, there is either a lack of clear forest development policy, or the adopted model has penalized the forest industry to the extent that operations are becoming unattractive to investors.

For the forest sectors of most countries, the investment climate has worsened in the last few years. As identified in a recent study carried out by the Inter American Development Bank (2005), the investment climate needs to be greatly improved if direct investments are to increase and if forest sustainability is to be ensured. In most countries of the region, many intra- and inter-sectorial issues need to be dealt with; there is a generally unstable sectorial legal and institutional framework, poor law enforcement, growing transaction costs as a result, for instance, of new national regulations, market requirements such as certification, and other factors.

Under such a situation, investments in the Latin American tropical forest industry (including the tropical plywood industry) is expected to be very limited in coming years. Changes in the investment climate for the tropical timber industry, although recognized by some countries as necessary, will take quite a long time (and might never happen). As a result, new players entering the tropical plywood business in the region in the next few years will most probably be rare. This means that the expansion or upgrading of existing plywood mills will not happen and therefore tropical plywood production in Latin America will not grow significantly in the future.

In any case, more changes will take place. Tropical plywood producers are taking actions to ensure the future raw-material supply. This includes adopting or improving forest management practices in natural forests and/or moving gradually towards plantations.

Thus, the tropical plywood industry is expected to increase its investment in forest plantations. This will also require investments in new technology and equipment to adapt mills to the new raw material.

Tropical plywood producers in Latin America are also moving towards composite and value-added products. Combi-ply using temperate timber in the core and natural tropical veneer as face material is already quite a common product in the market. The combi-ply of the future will include products comprising all tropical materials, with natural tropical timber as the face veneer and tropical plantation timber as the core. As for value-added products, more tropical plywood will be traded as flooring material and other engineered products.

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African tropical plywood production and trade trends*

Alhassan Attah, Executive Director
Ghana Forestry Commission

Figure 16 shows that African countries produce a small percentage of global tropical timber and account for only 0.6% of global plywood production and 1.6% of global plywood exports.

Figure 16. Share of tropical timber production by region (2004)

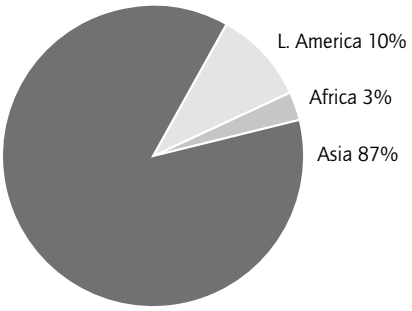
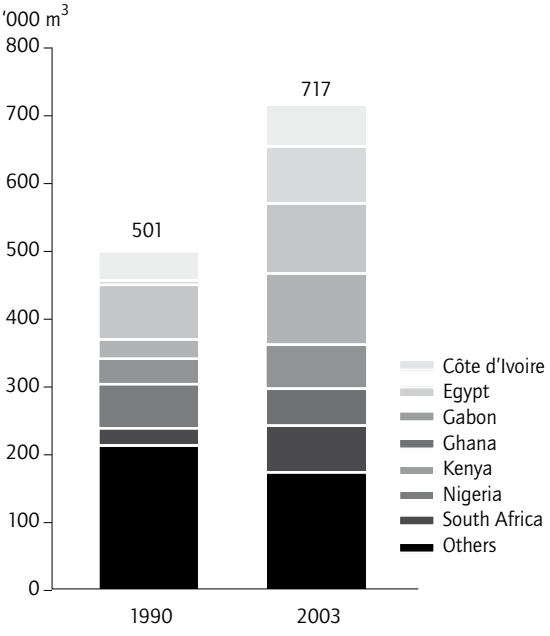


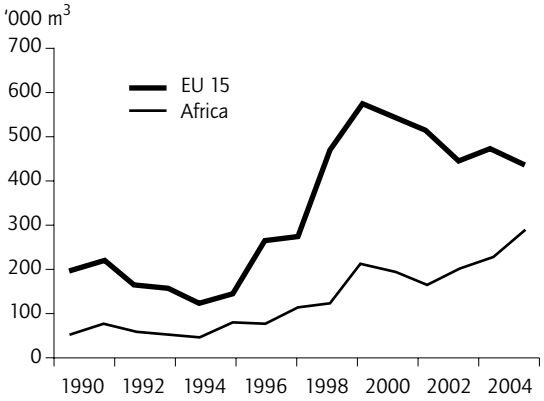
Figure 17 shows the main African plywood producing countries, where 'others' includes 15 countries in the region. The tropical countries produced 74% of the total in 1990 and 67% in 2003; the largest non-tropical producer in 2003 was Egypt.

Figure 17. African plywood production



The major exporters of African tropical plywood are Gabon, Ghana, Côte d'Ivoire and Cameroon and their main trading partners are the EU 15 (particularly Italy, France and Greece) and Nigeria (figures 17–18). Total Africa volume of all plywood exports in 2003 was 300,000 m^3, four countries accounting for more than 75% of this. The inter-African trade has grown in recent years but the plywood trade with China is negligible.

Figure 18. EU-African tropical plywood exports



The total volume of African imports of all plywood in 2003 was more than 500,000 m^3; four countries accounted for more than 78% of this (Table 17), and there was very little intra-African trade.

Conclusions and recommendations

- Africa's share of production and trade in tropical plywood remains low
- Exports to the EU continue to dominate plywood trade
- Inter-regional trade, though small, is growing
- Africa exports little plywood to China
- African tropical countries should reduce sliced veneer sales in favour of producing decorative plywood for the up-scale market using lesser used species as core material and traditional species as face material
- African tropical countries should focus on domestic and regional markets

** Text prepared by the editors based on a Powerpoint presentation given at the conference*

Table 16. Export trade of tropical plywood, 2003 (m^3)

Country	**Gabon**		**Ghana**		**Côte d'Ivoire**		**Cameroon**	
Total exports	**102,887**		**79,674**		**27,797**		**12,444**	
Top destinations	EU 15	96%	USA	33%	EU 15	47%	EU 15	40%
	Italy	44%	EU 15	30%	France	24%	Italy	26%
	France	39%	Belgium	18%	Germany	9%	France	6%
	Netherlands	12%	Italy	3%	Italy	6%	Greece	5%
	Senegal	1.9%	France	3%	Senegal	16%	Senegal	13%
	Cameroon	1.3%	Nigeria	22%	Mali	12%	Hong Kong	9%

Table 17. Import trade of tropical plywood, 2003 (m^3)

Country	**Algeria**		**Egypt**		**Nigeria**		**South Africa**	
Total imports	**307,335**		**132,566**		**36,780**		**21,928**	
Top Sources	Indonesia	96%	Malaysia	60%	Togo	83%	Zimbabwe	29%
	China	2%	Indonesia	37%	EU	8%	EU	23%
	Liberia	1%	Brazil	2%	Benin	4%	Malawi	13%
	Singapore	1%	China	1%	Ghana	2%	Malaysia	12%
	–	–	–	–	South Africa	2%	Singapore	12%

Panel on Consumers Regional Perspectives*

Plywood industry in Japan

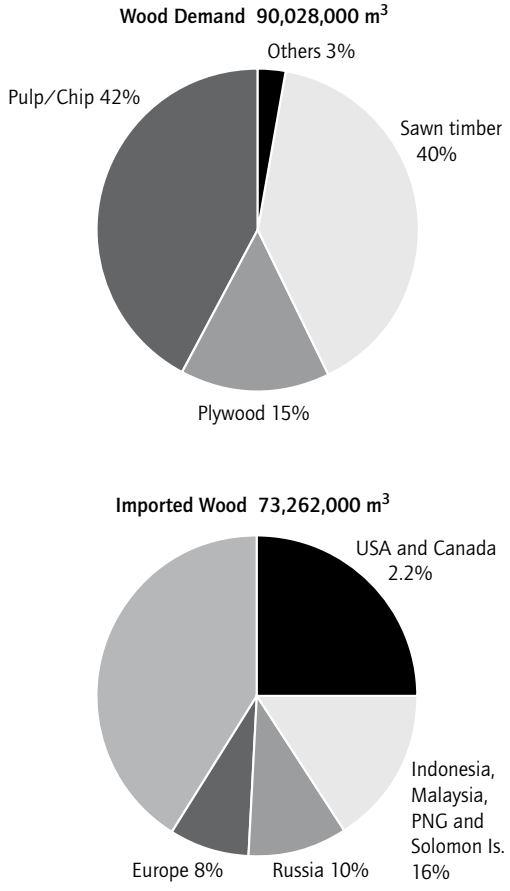
Kimio Yahaba
JPMA

Situation of wood supply and demand in Japan

The total wood demand in Japan was 90,028,000 m^3 (log equivalent) in 2004. Breakdown: 40% for sawn timber, 15% for plywood, 42% for pulp/chip and 3% for others (Figure 19).

The supply: domestic wood amounted to 19% (16,766,000 m^3), imported wood 81% (73,262,000 m^3). Breakdown of imported wood: USA & Canada 25%, Indonesia, Malaysia, Papua New Guinea (PNG) and Solomon Islands 16%, Russia 10%, Europe 8% and others 41% (Figure 19).

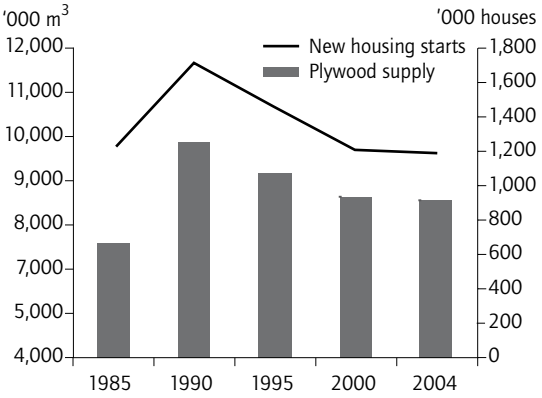
Figure 19. Wood demand and imports in Japan, 2004



Plywood supply and housing new starts

Nearly 90% of the plywood supply is used in the housing sector. The plywood supply is falling due to a decrease in housing new starts (Figure 20).

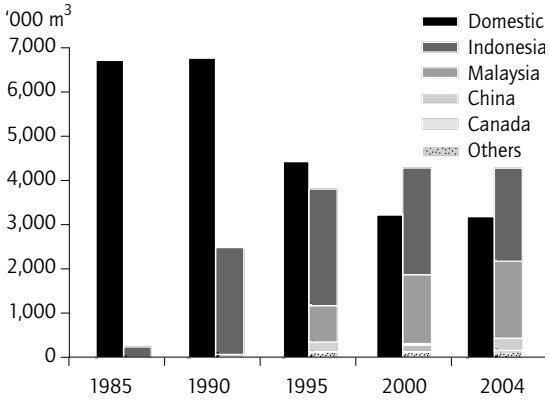
Figure 20. Plywood supply and housing new starts



Breakdown of plywood supply (by country)

The supply of imported plywood in 2004 was 17 times higher than the level recorded in 1985. The supply of domestic plywood in 2004 was 53% lower than in 1985, while the main supplying countries were Indonesia and Malaysia.

Figure 21. Imported plywood

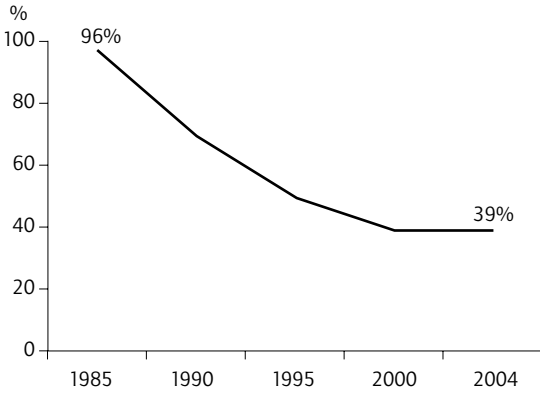


** Text prepared by the editors based on a Powerpoint presentation given at the conference*

Self-sufficiency (%) = domestic supply ÷ total supply × 100

Self-sufficiency declined from 96% in 1985 to 39% in 2004 (Figure 22).

Figure 22. Japanese self-sufficiency in plywood supply



Domestic plywood production by thickness

The production ratio of thick plywood (12 mm or greater) has increased; in particular, the domestic production ratio rose from 55% in 1985 to 79% in 2004 (figures 23 and 24).

Softwood and hardwood domestic plywood production

Total domestic plywood production has diminished by half in recent decades; nevertheless, softwood plywood production has increased as a proportion of total production from 2% in 1985 to 68% in 2004 and has slowly substituted the plywood produced from hardwood during the period (Figure 25).

Figure 23. Japanese domestic production volume of plywood by thickness ('000 m^3)

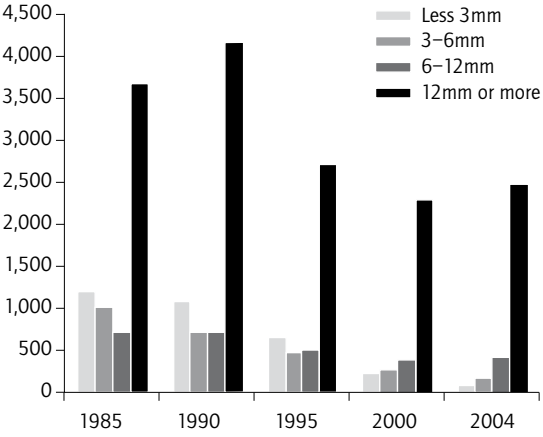


Figure 24. Ratio of thick plywood

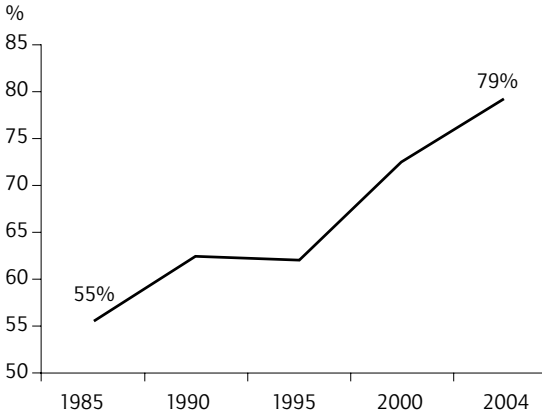
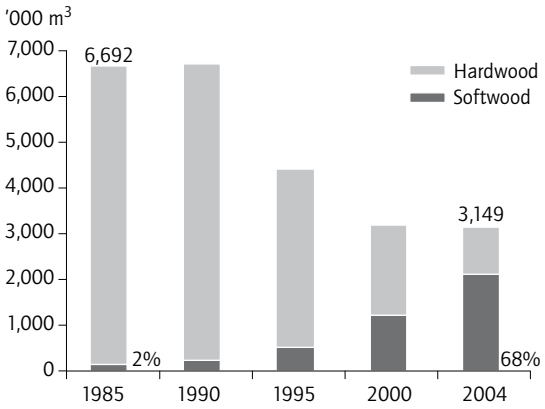


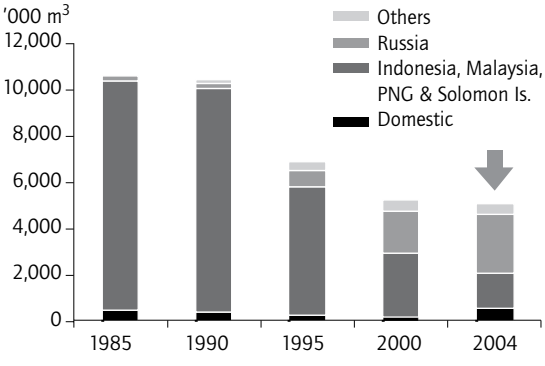
Figure 25. Japanese softwood and hardwood plywood domestic production



Log consumption for plywood production

Log consumption for plywood production in 2004 was 4,994,000 m^3, imported logs accounting for 89% and domestic logs for only 11%. The main log-exporting countries were Indonesia, Malaysia, PNG, the Solomon Islands and Russia, this last country being the only one to have increased exports in recent years (Figure 26).

Figure 26. Japanese log consumption for plywood production



Change in number of plywood factories

The total number of plywood factories fell from 554 in 1985 to 286 in 2004 (Figure 27).

Plywood imports

Plywood imports in 2004 totaled 4,941,000 m^3. By thickness, those less than 3 mm accounted for 8%, 3–6 mm for 9%, 6–12 mm for 68% and 12 mm or more for 15% (Figure 28).

Figure 27. Historical change of number of plywood factories in Japan

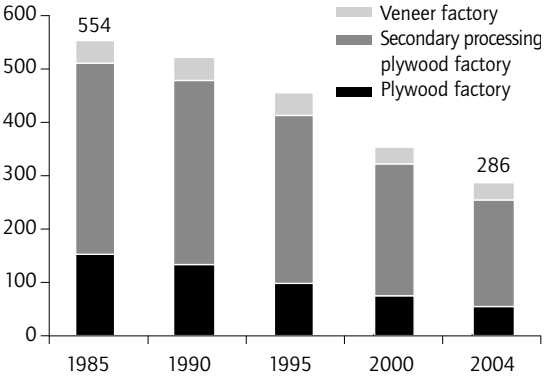
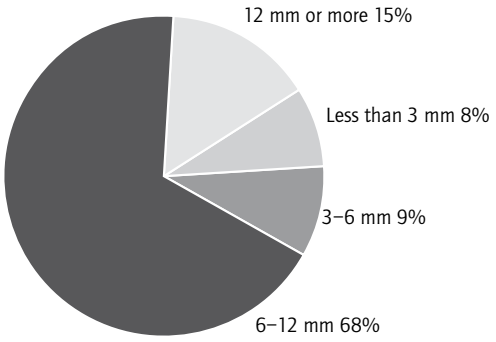


Figure 28. Japanese plywood imports by thickness



Plywood imports from Indonesia

Of the total plywood import volume of 4,941,000 m^3 in 2004, Indonesia accounted for 2,424,000 m^3, or 49% (Figure 29).

Plywood imports from Malaysia

Of the total plywood import volume of 4,941,000 m^3 in 2004, Malaysia accounted for 1,995,000 m^3, or 40% (Figure 30).

Figure 29. Japanese plywood imports from Indonesia

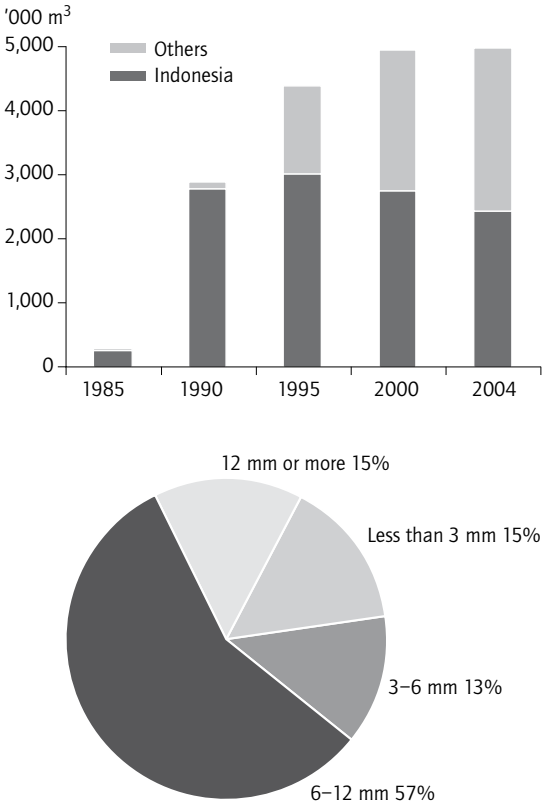
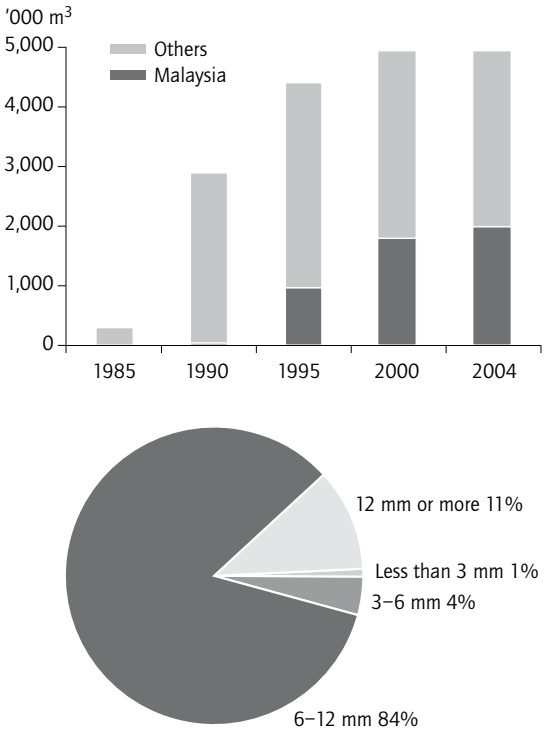


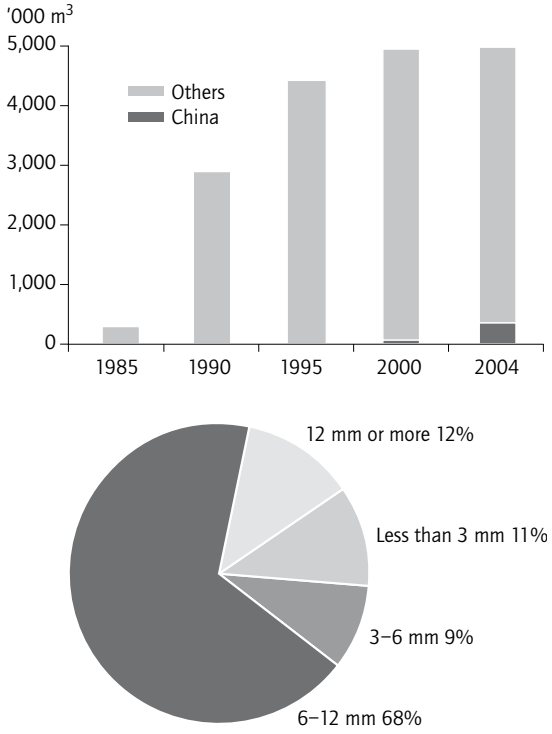
Figure 30. Japanese plywood imports from Malaysia



Plywood imports from China

Of the total plywood import volume of 4,941,000 m^3 in 2004, China accounted for 334,000 m^3, or 7% (Figure 31).

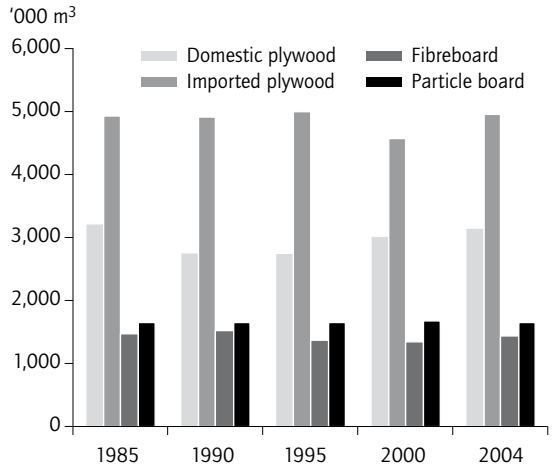
Figure 31. Japanese plywood imports from China



Supply volumes of plywood, fibreboard and particleboard in recent years

There has been no significant change in the total supply volume of plywood, fibreboard or particleboard during the current decade (Figure 32).

Figure 32. Japanese imported plywood and other boards

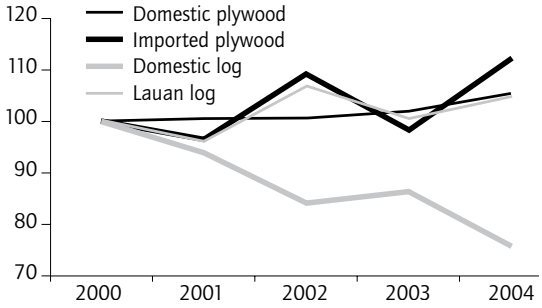


Business Price Index for plywood and logs in recent years

(compiled by the Bank of Japan)

- The price index for domestic plywood has been steady
- The price index for imported plywood has shown many fluctuations
- The price index for domestic logs has shown a declining trend
- The price index for lauan logs has shown many fluctuations

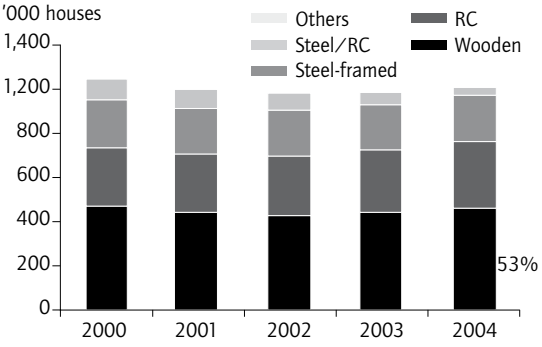
Figure 33. Business Price Index for plywood in Japan



Number of new housing starts by structure in recent years

The ratio of new wooden houses has been steady at around 53% (Figure 34).

Figure 34. Number of housing starts in Japan



Primary tasks for the plywood industry

- Improve plywood performance to maximize housing value, especially with regards to earthquake resistance, fire resistance, durability, workability and design ability
- Contribute to the efficient use of forest resources in the world by promoting the effective utilization of poor-quality logs and logs from hitherto unused species as raw materials for plywood

US plywood market growth, potential and opportunities

Stuart Clarke
Clarke Veneers and Plywood, USA

IWPA

IWPA is the only US-based trade association that represents overseas manufacturers interested in the US market, US importers and manufacturers that use imports, and shipping lines, ports and others involved in global logistics. This association includes 210 of the largest companies in the industry that, collectively, import the majority of all hardwood plywood that enters the US. Members also import hardwood flooring, decking, lumber and lumber products, veneer, and a full range of softwood products.

The association annually organizes a convention and tabletop tradeshow that brings together nearly 400 buyers and sellers to meet and exchange current information and seek new business opportunities. It also provides industry information and drives business to member companies, with more than 8,000 unique hits on its website each month. The association's product standards are globally recognized and are essential for accessing the US market. US-based manufacturers and consumers are growing ever more critical and demanding, showing an increasing willingness to switch suppliers and countries of origin should problems develop.

Imported Wood is the most recent publication produced by IWPA; it has been distributed to 15,000 key industry contacts, educating them on issues and growing the market for imported woods in the US.

The final core area of the Association's work relates to US government affairs and activities: everything might be right in production and marketing, but if a product is denied entry at a US port because of customs regulations, new solid wood packing regulations, or concerns over it being of 'illegal origin', then everything that was done in marketing and production becomes inconsequential.

US: the big picture

The US economy is growing again, home sales are on record pace, consumer spending continues to impress, and jobs are starting to rapidly re-emerge. To summarize:

- Economy is maintaining solid growth
- Interest rates are near 40-year lows
- Industrial production strongest in six years
- Housing starts at historic high levels
- Minimum inflation
- Consumer, business spending strong
- Imports continue to gain market share

These positive economic indicators push the demand for hardwood plywood. Hardwood plywood is used throughout the US economy in residential and commercial applications – from kitchen cabinets and flooring to architectural and furniture.

Figure 35. US hardwood and softwood applications import growth, 2003–2004

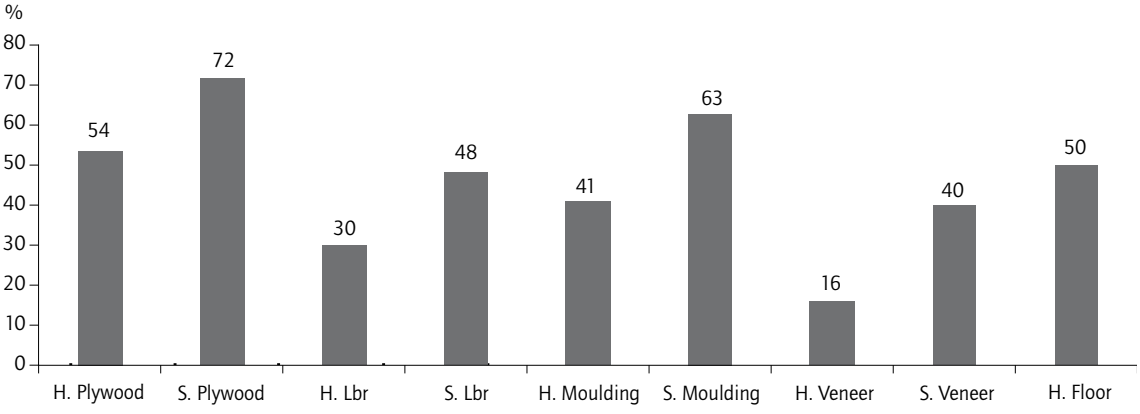
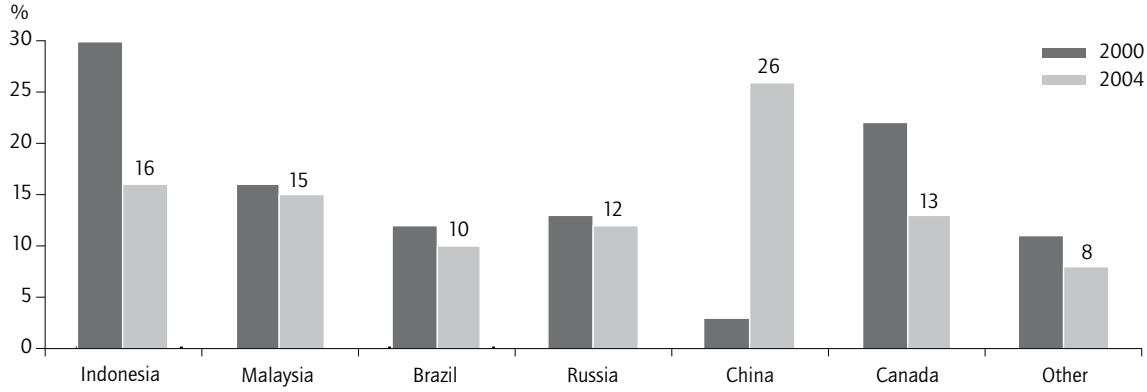


Figure 36. Country market share of US imports, hardwood plywood (2000 vs 2004)



US import growth

Demand is across all product segments: hardwood plywood, softwood plywood, softwood moulding and hardwood floors all showed significant growth last year. Since domestic production has been flat to down over the past few years, the 54% increase in hardwood plywood imports into the US show that imported hardwood plywood is enjoying a current competitive advantage over US production. It always boils down to price (including how claims are handled), quality, and availability.

US importers have helped play a key role in this growth as they are willing to maintain just-in-time inventories, meet the increasingly shortened lead times, and accept an increasing level of risk that the large retailers and end-users are demanding yet are unwilling to bear themselves.

- Maintain just-in-time delivery
- Meet shorter lead times
- Willing to accept risk
- Responsible for quality

US importers also realize that the market – on both the supply and customer sides – is changing rapidly. Traditional sources are no longer traditional sources, and traditional customers are no longer our traditional customers.

- Innovation in wood industry
- New sources
- New suppliers
- New customers

Figure 36 shows the rapid change in the market share of US imports held by various countries from 2000 to 2004. Indonesia's share dropped from 30% to 16% and China's rose from 3% to 26%. The total increase in hardwood plywood imports last year was 54%, so unless their shipments were rapidly increasing, countries were losing market position in the US market. That is how quickly things can change. Imports are now almost equal to total US production. This is a figure to watch closely, as US industries tend to react quite negatively when this ratio exceeds 50% – just look at what happened in the furniture industry, with trade actions against China and the US dispute with Canada over softwood lumber.

While the growth in imports paints a very good picture for international trade, and while there is a strong link already established between US importers and their overseas suppliers, several key issues must be addressed by overseas manufacturers to maintain their position in this market:

Path to increased US market share

- Continue investment in quality
- Reduce formaldehyde levels
- Maintain proper moisture content – must be less than 12%
- Produce to meet IWPA standard
- International Hardwood Products Association (IHPA) Grade

Reduce formaldehyde levels

Formaldehyde is a critical issue, as can be seen in the stories below:

"A Connecticut woman says her four-year-old daughter spent three days in the hospital because of a severe reaction to formaldehyde fumes given off by a new bedroom set. The suit seeks an injunction to stop selling the furniture that is made overseas. Additionally, the suit seeks to have the furniture tested, labeled with suitable warnings of potential hazards, and to require the defendants to create a plan of relief for persons who purchased the furniture." – Consumer Affairs, April 12, 2004

"Milford girl's illness blamed on bedroom furniture Milford, CT – A family is filing a class-action lawsuit against a furniture store and a manufacturer because they believe formaldehyde in their daughter's bedroom furniture made her sick. The suit seeks to stop the selling of furniture that is made overseas."

It is no leap to think that these lawyers could turn their attention to plywood. In addition, US states are taking a more proactive stance on the formaldehyde issue and are increasing their regulation. IWPA and other trade associations are currently engaged with the State of California and its rule-making process on emissions. Overseas manufacturers should work hard to achieve the emissions identified in the IWPA standard and produce to E1 every day for your entire product.

Warped panels result from poor moisture control in the production

Warped panels like these are often the result of poor moisture control in the production of the panel. Warping is a distortion of the intended shape of a panel and can take forms such as twisting or cupping. Warping can occur in plywood panels when the components on each side of the center ply or layer are not reasonably well balanced in thickness, moisture content, or grain orientation. It is critical that each sheet of veneer used to make plywood has a moisture content of no more than 12%.

The unfortunate reality is that many US end-users react to problems of formaldehyde or warped panels with over-generalized solutions. For example, many end-users are likely to say "no more plywood from that country" if they run into problems like these, instead of getting their suppliers to take the necessary time to identify and work with high-quality manufacturers in that country.

Quality control produces to IHPA grade

The IWPA standard details requirements for face, back and core ply grades, glue bond line and moisture content. It also covers workmanship, core types, and dimensions, tests, packing, and marking.

- Chinese version available
- Both English and Chinese versions are available in pdf format

The solution to most of these problems is to produce to existing standards like the IWPA standard and to recognize this commitment through use of the IHPA trademark.

The procurement standard for imported hardwood plywood describes plywood graded and marked in thicknesses of 2.7 mm through 25 mm. Requirements are described for wood species; veneer face, back, and core grades; panel construction and core provisions; dimensions; moisture content; formaldehyde; sanding; and finishing.

Below is a summary of the key provisions of formaldehyde and moisture content, as these are the main factors influencing the ability to expand market share.

IWPA standard – formaldehyde concentration

Hardwood plywood products made with urea-formaldehyde or melamine formaldehyde adhesives and/or surface coatings shall meet the following:

Product	Loading ratio (ft^2/ft^3)	Max concentration (parts per million – ppm)
Wall panel	0.29	0.20
Industrial	0.13	0.30

The maximum concentration level of formaldehyde in IWPA's standard for wall panels is 0.20 ppm and is 0.30 ppm for industrial stock panels. Panels that meet E1 should meet either of these two US requirements when tested to American Society for Testing and Materials E1333. It is very important that manufacturers continue to make significant progress in assuring all exports into the US meet E1 and IWPA standards so we can avoid even stricter government requirements.

IWPA standard – moisture content requirement

Moisture content requirement: The moisture content of plywood panels at the time of shipment from producing mill shall not exceed 12%. Wood products

readily accept and lose moisture in both exterior and protected heated interior applications. As wood gains or loses moisture it expands or contracts.

Factors related to the wood species, the moisture content of the components, and the glue spreading and hot-pressing processes can all cause dimensional change in wood products. Dimensional change can give rise to face checking and warping.

Trade and environment

In addition to these specific quality-based issues, several other changes are occurring in the market that must be closely watched and addressed as needed.

Solid wood packing

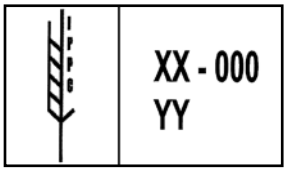
The International Plant Protection Commission (IPCC) Standard, final ruling, published September, 2004, effective 2005, requires a stamp on the ends of pallets proving:

- heat treatment to a minimum core temperature of 56°C for a minimum of 30 minutes, OR
- fumigation with methyl bromide: must be done prior to arrival in US.

Consignments entering the US must comply with the International Standards for Phystosanitary Measures No 15 (ISPM 15), which set out the guidelines for regulating wood packaging material used in international trade.

Non-compliance with this regulation could delay or impede your material from entering the US. It is very important to contact your country's national plant protection office to get more information on compliance.

The guidelines are international: They set out the requirements for the heat treatment or fumigation by methyl bromide of packing cases, crates, drums, pallets, load boards, pallet collars and dunnage. Material that has been treated needs to be marked as follows:



IPPC symbol

'XX' in the box above represents the ISO two-letter country code and '000' represents the unique number assigned by the national plant protection office to the producer of the wood-packing material, who is responsible for ensuring appropriate wood is used and properly marked.

Appropriate treatment code ('YY') is either HT for heat treatment or MT for methyl bromide by a certified body indicating treatment method and country code number.

These requirements are aimed at reducing the risk of introduction and/or spread of quarantine pests associated with wood-packaging material. Both coniferous and non-coniferous raw woods are covered. Plywood and other non-solid wood materials used as a packaging material do not require treatment.

Illegal logging

The 2004 ITTO report 'Reviving Tropical Plywood' identified several challenges and recommendations. Challenges included a lack of transparency in the plywood market, product substitution, log shortages and price volatility.

Illegal logging is a subject that ITTO and ATIBT have addressed in many national and international conferences and workshops, and it is necessary to stress the meaning of 'legality'.

A recent study in the US, 'Illegal Logging and Global Wood Markets', concluded that between 2 and 4% of softwood lumber and plywood traded globally, and as much as 23–30% of hardwood lumber and plywood traded globally, could be of suspicious origin.

Importers in the US are becoming increasingly aware of the need to trade in verified legal timber products. Although the demand is less pronounced than in Europe, we are facing procurement requirements from our customers and run the risk of legal liability if we cannot answer fundamental questions about the origins of our product.

The President's Initiative against Illegal Logging (PIAIL), launched in July, 2003, is the official US government program addressing global illegal logging and its associated illegal trade. The focus of the Initiative is on stopping illegal logging in protected areas. Some US-based retailers have also announced efforts to help in the fight against illegal logging by developing procurement standards that favour certified wood.

What is being done to address this problem? What can we as purchasers do to help producers? Our customers are increasingly asking us these questions.

Industry trade groups such as IWPA are committing resources to educating members on strengthening and evaluating their supply chain, and we look forward to working with ITTO and its producer country members on practical solutions.

Logistics

- Difficulty in obtaining vessels
- Increasing freight rates
- Over-aged vessels
- Customs Trade Partnership Against Terrorism (CTPAT)/Coast Guard Security

The difficulty in obtaining vessels, increasing freight rates, increasing insurance because of the over-aged vessels in use, and new US security regulations, all drive up our costs of doing business. The US market does not only compete with other plywood importers, it is competing with other commodities, and global macro-economic stresses.

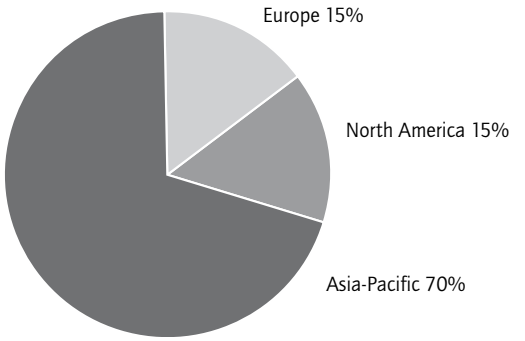
The US market needs to work hard every day in production, marketing, and governmental affairs – but together we can protect and expand the US market for imported hardwood plywood.

Europe: tropical plywood market status and trends*

Andy Roby
UK Timber Trade Federation

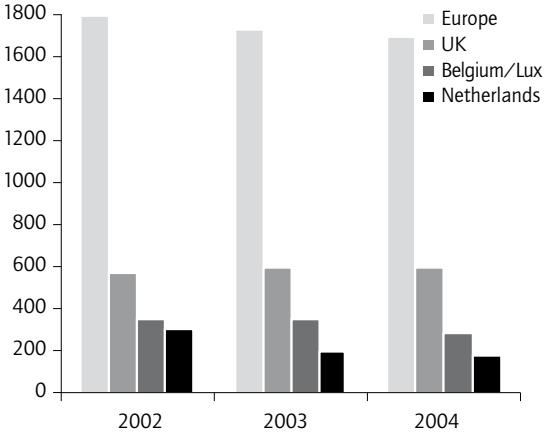
European market status

Figure 37. % tropical hardwood exported to major markets



Source: ITTO 2004

Figure 38. EU imports of tropical hardwood plywood ('000 m³)



Some new EU market drivers

- Government procurement policies
- Big building company purchasing policies
- Timber traders corporate social responsibility (CSR) policies
- Campaigns by non-governmental organizations (NGOs)
- EU legislation
  - CE marking
  - Illegal logging (forest law enforcement, governance and trade – FLEGT – regulation)

Timber trade in the firing line

A price premium in the UK

Oliver Report

Is there a premium for verified legal or certified timber? Fifteen agents, importers and merchants, for timber delivered to the UK, said:

- *No for softwoods*
- *Yes for hardwoods: 2–30%*

A new trend

"Considerable interest throughout the UK in sourcing and marketing verified legal and sustainable timber"

"… A significant number of larger companies stated that they were now implementing systematic procedures aimed at ensuring that 100% of their supplies derived from demonstrably legal sources"

Perspectives for tropical plywood

Challenges ahead

- Help suppliers meet new environmental demands (see Timber Trade Action Plan)
- Harmonizing purchasing policies
- Working with local and international NGOs
- Quality control
- Help tropical hardwood plywood move up-market

** Text prepared by the editors based on a Powerpoint presentation given at the conference*

India: the emerging market for wood-based products

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Arunachal Plywood Industries Limited, India

Abstract

Demand for bamboo- and timber-based panel products is rising rapidly in India with the increased pace of economic growth. However, environmental concerns and a lack of awareness of alternatives to timber goods have left a substantial gap between demand and supply. Indian manufacturers do have the potential to become a vibrant trading centre for bamboo, timber and rattan products in the immediate future. This, however, requires a close partnership between the government, private entrepreneurs and the community at large.

Introduction

In the mid 1980s, India embarked on a path of economic reforms that included the liberalization of external and trade accounts, dismantling the 'licence raj', and opening the virtually closed economy to foreign companies. The reforms that were put in place at that time led to an upsurge in business optimism in India. Consequently, India has been able to sustain an economic growth rate of over 6% per annum since the mid 1990s – a growth rate that has been surpassed only by China.

The services sector, which includes construction, housing and real estate development, and information technology, among others, has been the main source of growth in India. For example, the construction industry has been growing at a phenomenal rate: some leading contractors showed 30–100% growth rates in the first nine months of 2004–05 (Source: CMIE). This has also led to growth in ancillary industries like cement, particleboard, etc. For example, the market for particleboard increased from Rs1.6 billion (US$1 = Rs45) in 1990–91 to more than Rs5 billion in 2004–05 and is expected to double by 2014–15 (Source: INTECOS – CIER). Demand for wood and wood-based products is increasing at a rate of 10% per annum[1].

However, during the same period, environmental considerations led the Supreme Court to impose several constraints on the use of timber. In December 1996, it banned the felling and transportation of trees and timber in the northeastern states, the mainstay of the plywood industry in India. This order was later modified, whereby a few plywood units were allowed to operate provided the forest could produce round timber on a sustainable basis. Many plywood units had to shut down their operations completely due to the unavailability of raw materials, use imported timber from Myanmar and Malaysia, or obtain their timber from small-scale private plantations. The production of round timber from natural forest declined substantially, from 313.1 million m^3 to 16.1 million m^3 in 2000. The capacity utilization of the organized-sector plywood industry in India halved from 64% in 1996–97 to only 33% in 2001–02. No reliable data are available for the small-scale plywood industry established in areas with plantation timber.

The above numbers suggest that the gap between demand and supply of wood-panel-based products is increasing rapidly. While imported timber-based plywood production is currently a viable alternative, in the long run the use of wood substitutes like bamboo splint, mat and veneer composites, which have great potential to replace the best-quality wood as building and furniture material, need to be encouraged. India has the second-largest growing stock of bamboo after China. Further, the regeneration cycle of bamboo plants is a little over four years. Thus, unlike wood-based industries, a sustainable raw material supply both today and in the future is ensured. In 2003, The Planning Commission (a Government-of-India department) created a bamboo mission, the National Mission on Bamboo Technology and Trade Development (NMBA).

In this paper, we highlight the growth in demand for wood-based products over time. Although the demand is high and rising continuously due to strong growth in other sectors of the economy, the supply of domestic timber is virtually negligible. We also argue that although wood-based industries are currently able to sustain production using imported timber, the future is in using bamboo splint, mat, and veneer composites and other bamboo products as alternatives to wood-based products. The final section of our paper presents some conclusions that can be drawn from our study and our thoughts on the prospects of bamboo as a commercial alternative to plywood.

[1] *The majority of the timber raw material in India is converted into plywood.*

Industry details and market trends of plywood industry in India

Since its inception during World War I, India's particle and plywood industry has grown nearly six-fold. The larger producers account for 15% of total production in the industry, producing approximately 30 million m^3 of plywood and blockboards annually. However, 60% of the industry is in the informal sector. The Indian market for particleboard and plywood is estimated in value terms at over Rs17 billion of the total market[2]; particleboard accounts for over 30% of the market, with the rest – over 70% – accounted for by plywood segments. In 1999–00 there were 4,235 registered plywood factories and the industry employed approximately 93,000 workers. In 2002–03, net value-added for the 'manufacture of wood and of products of wood and cork, except furniture, manufacture of articles of straw and plating materials' amounted to Rs38,902 lakhs. Table 18 gives details about the growth of the plywood industry in India.

Table 18. Growth of plywood industry in India

Year	Installed capacity (million m^2)	Production (million m^2)	Capacity utilization (%)
1988	122.44	59.93	49
1989	122.44	54.31	44
1990	122.44	64.48	53
1991	122.44	62.52	51
1992	122.44	57.78	47
1992–93	122.44	62.76	51
1993–94	122.44	67.33	55
1994–95	122.44	72.35	59
1995–96	122.44	73.15	60
1996–97	122.44	77.75	64
1997–98	122.44	68.14	56
1998–99	124.04	52.34	42
1999–00	124.04	43.00	34
2000–01	124.04	40.12	32
2001–02	124.04	41.75	33

Source: Industrial Data Book 2002–03, CIER

The table clearly shows that installed capacity has increased over time; however, since 1996–97, when the Supreme Court imposed a ban on timber felling and transport from the northeastern states of India, there has been a sharp fall in both production and capacity utilization. But the requirement for timber continues to increase. Between 1996 and 2006, timber requirements for housing, furniture, agricultural implements and industry increased by 27%. They are forecast to increase even more in the future, with a growing economy, increasing middle- and upper-income groups, a rapidly increasing construction sector and easy financing options available for housing and furnishings (see Table 19 for details).

Table 19. Demand for timber in India (million m^3)

Items	1996	2006
Fuel	201.00	NA
Housing	35.00	43.00
Furniture	9.40	11.60
Agriculture implements	10.00	12.00
Industry	10.00	15.20
Total demand (excluding fuelwood)	64.40	81.80

Sources: Forest Survey of India, Ministry of Forests and Environment, Government of India (1996), (2001)

In addition to the domestic demand for panel products, countries like the oil-rich Middle-eastern nations, Pakistan, China, Myanmar, Bangladesh, and Sri Lanka could all be potential markets for wood panels, bamboo panels and rattan furniture. India has the potential to re-export timber products by adding value to them.

Problems faced by the plywood industry

As mentioned earlier, in December 1996, the Supreme Court imposed a ban on the felling and transport of timber from the northeastern region, which then constituted 60% of plywood production in India. As a result, capacity utilization more than halved and dependence on imported timber increased significantly. Did the ban lead to an increase in dense forest cover and the establishment of substantial forest plantations, occurrences that might persuade the authorities to reverse the ban on felling of trees in India? Unfortunately, while the steps taken by the Supreme Court to preserve the nation's fast-depleting forest cover were commendable, even today, while the target for forest cover is 105 million hectares, actual forest cover is only 64 million hectares, of which dense forest cover is 36 million hectares and degraded forest cover is as much as 28 million hectares[3].

[2] *US$1 = Rs45, 1 lakh = 100,000, 1 crore = 10,000,000*

[3] *The major factor in the degradation of forests is the unmonitored extraction of fuelwood and fodder. The current sustainable production of fuelwood from forests is 17 million tonnes and from farm forestry and other areas 98 million tonnes. There is a net deficit of 86 million tonnes of fuelwood, which is then extracted from the forest. Forests therefore contribute nearly 30 percent of fuel and fodder requirements of the country. This amounts to approximately 178 million tonnes of green fodder and 148 million tonnes of dry fodder.*

Possible solutions

Given that the timber requirements of the plywood industry can hardly be met from domestic sources, and given that there is little hope of substantial improvements in supply in the future, the wood-panel industry is trying to meet the challenge by using imported tropical timber blended with plantation timber. Today, more than 3 million m^3 of industrial roundwood is being imported annually from Indonesia, Colombia, Malaysia, Myanmar and New Zealand. The total volume of imported wood logs more than doubled between 2001–02 and 2003–04.

However, near complete dependence on imported timber as a source of raw material for the Indian plywood industry may not be a pragmatic business option in the long run, given that globalization has increased the vulnerability of economies to economic crises in other countries.

Moreover, many countries, and particularly those in the EU, have introduced environmental requirements for manufacturing. Such requirements may have consequences for complete industrial chains. It is therefore advisable for manufacturers and/or suppliers of raw materials to analyze the influence of their operations and decisions on environmental impact later on in the chain. It shows good marketing skill to anticipate not only the environmental aspects involving one's 'own' market but also to recognize the environmental issues elsewhere in the industrial chain. For example, there are restrictions on imports into the EU of timber products that are made from endangered species of timber (see Van Leeuwen 1998 for details). Forest certification is necessary.

Keeping all the possible potential obstacles to using timber as a raw material in mind, the Indian plywood industry must start rethinking and exploring the option of substituting bamboo-based panels for wood-based panels.

Bamboo has been recognized as a sustainable alternative for virtually every end-use where timber/wood is used. Modern technology allows bamboo to be converted into particle and mat boards, floor tiles, corrugated sheet panels, etc, all items that are required in the fast-growing construction sector. Moreover, these bamboo products can be further transformed into doors and door frames, windows and window frames, furniture, roofing materials, office cabins, etc. The quality of bamboo products is comparable with the best-available timber products.

Table 20. Imports of logs and wood products in India (10 million rupees)[4]

Serial No	Description	2002–03	2003–04	2004–05
4403	Logs	1,603.39	3,068.14	3,685.47*
4407	Sawn timber	34.18	56.60	59.50*
4408	Veneer, etc	15.99	16.55	22.03*
4410	Particleboard, etc	34.64	60.87	75.32*
4411	MDF/ hardboard, etc	48.76	60.05	78.65*
4412	Plywood, etc	16.88	19.31	22.83*
9403	Wooden furniture, etc	32.25	56.32	74.95*
Grand total	1,786.09	3,337.84	4,018.75	

Source: Directorate General of Commerce Intelligence & Statistics, Kolkata

** = expected*

A large stock of bamboo is already available in India, and the Government of India has instituted the National Mission on Bamboo Technology and Trade. This aims to encourage the scientific management of bamboo plantations and provide entrepreneurs with opport–unities to develop technology to make bamboo products a commercially viable substitute for wood products.

Table 21. India log imports, 1995–2005

Year	Quantity (m^3)	Value (in crores of rupees)
1995–96	735,062	755.52
1996–97	868,799	875.71
1997–98	1,362,258	1,436.92
1998–99	1,614,813	1,428.00
1999–00	1,950,132	1,860.00
2000–01	2,097,851	2,092.00
2001–02	2,055,841	2,431.00
2002–03	1,399,132	1,603.39
2003–04	2,992,303	3,068.14
2004–05	3,298,257	3,685.47

Source: Directorate General of Commerce Intelligence & Statistics, Kolkata

However, market awareness of the inherent 'good' properties of bamboo ply-board (ie its durability, strength, water resistance and structural design, work-ability and fire resistance) is dismal. Informal market research was conducted to assess the awareness of bamboo intermediary products among wood-based manufacturers. Of the 13 large firms surveyed, only three were aware of the possibility of using bamboo

[4] *Exchange rate (September 2005): US$1 = Rs43.22*

to make plywood and only one acknowledged that the product could become successful in the future.

Conclusions

India can become a vibrant trading centre for bamboo, timber and rattan products in the immediate future. A more than adequate supply of renewable raw materials like bamboo exists. Opening up trade routes with neighbouring countries like Myanmar will ensure a steady supply of raw timber to ensure rapid growth in the bamboo and wood-based industries to meet ever-growing domestic demand. Moreover, India has the potential to re-export bamboo and timber products by adding value to them.

However, certain policy changes need to be made to ensure the success of the panel and wood industries in India. Large investments need to be made in public-private partnerships in forestry as well as in manufacturing.

- Private sector should be involved in the regeneration of degraded forests
- Large-scale processing plants based on plantation timber, bamboo, rattan, imported timber, and semi-finished timber products should be modernized and installed
- Forest certification must be achieved as soon as possible
- Export-import firms that can look after the interests of the Indian bamboo and wood-based industries must establish offices in countries that have the potential to import bamboo and timber products
- Establish a statistical system to collect reliable data on the consumption of bamboo and timber products, based on which, future trends and policies can be formulated
- A more open policy will result in achieving a vibrant forest-based industry

Demand for bamboo- and timber-based panel products is rising rapidly in India with the increased pace of economic growth. However, environmental concerns and a lack of awareness of alternatives to timber goods have left a substantial gap between demand and supply. Indian manufacturers do have the potential to become a vibrant trading centre for bamboo, timber and rattan products in the immediate future. This however, requires a close partnership between the government, private entrepreneurs and the community at large.

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Session II: Opportunities and Challenges for International Trade in Tropical Plywood

Global trends in production and trade in tropical plywood and their outlook

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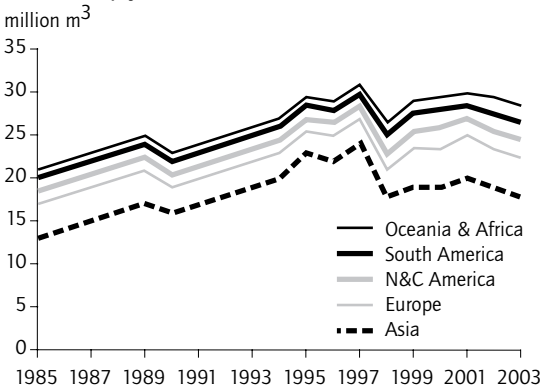
Tropical plywood status today

With the exception of 1998, overall worldwide production and consumption of plywood have remained relatively stable at about 55 million m^3 per annum. Since 1995, the production and consumption of hardwood plywood, which is predominantly tropical, have been close to 30 million m^3 per annum (Figure 39).

Figure 39. Worldwide production of hardwood plywood, 1985–2003



Source: various industry references

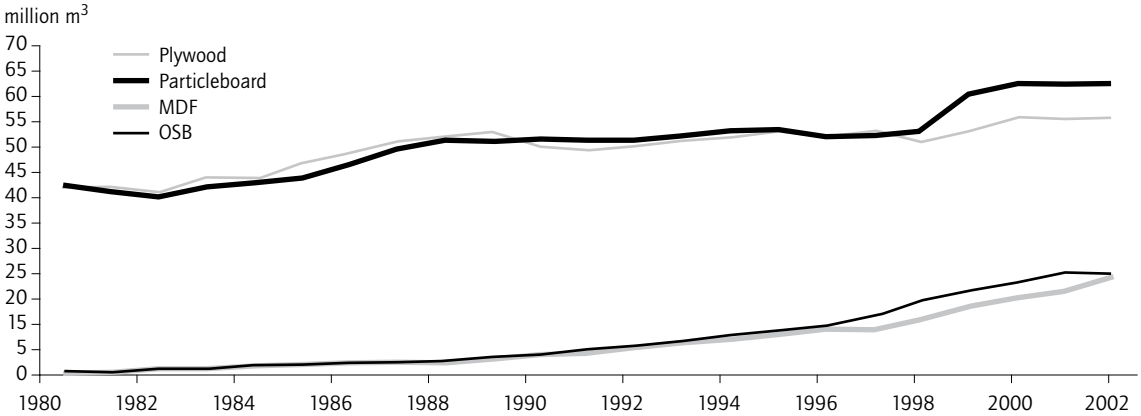
The relatively stagnant consumption trend of tropical plywood can be attributed to various factors, including the continued weakness in the Japanese economy (the leading consumer of tropical timber products), steady substitution by other types of panel products, both wood- and non-wood-based, and a decline in the construction of wooden housing in the traditional consumer countries.

On the other hand, the production and consumption of other panel products, predominantly reconstituted products such as particleboard, MDF and OSB, have experienced steady growth. As a result, the share of plywood as a percentage of total worldwide wood-based panels declined steadily from 41% in 1985 to 30% in 2002 (Figure 40).

Development of wood-based products

The method of processing wood materials can essentially be divided into three methods: sawing, peeling and chipping (Figure 41). The simplest process, which is still being used widely today, is sawing to produce lumber, mainly for structural purposes. It is believed

Figure 40. Worldwide production of wood-based panels, 1980–2002



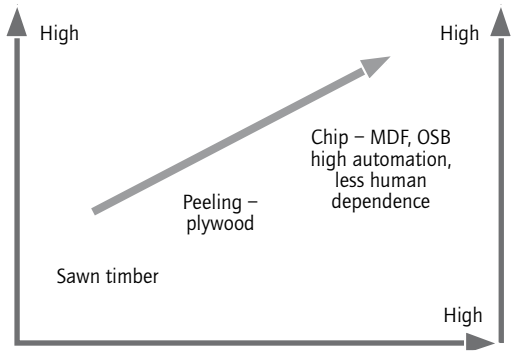
that the Egyptians discovered the peeling process, producing veneers that were then used to produce aesthetic panel products. The peeling technique has several advantages over sawmilling. However, the winning edge of the peeling technique in producing panel products was removed in the 20th century with the development of chipping technology, which, when combined with resin and pressing technology, was capable of producing high-quality panel products. The initial chipping process was further improved, prompted partly by the changing nature of and constraints to log supplies, to allow a wide variety of wood materials to be broken down into individual fibres, greatly increasing the versatility of the wood industry.

In terms of investment cost, log requirements and production capacity, these three processing methods differ significantly. In term of investment cost, sawing has the lowest outlay, the most basic set-up requiring as little as several thousand US dollars. A minimal peeling operation, depending on the level of integration and product quality considerations, could cost as little as US$20,000. However, for the chipping, which now includes the more sophisticated defiberization process, the investment cost is very high owing to the high speed and volume mass production concept. The most basic production line costs in excess of US$5 million.

The condition of the input wood materials for each of these three processes is also very different. For sawing, there is flexibility in the size of the logs; logs as small as 15–20 cm and as large of 60 cm in diameter can be sawn. In the peeling process, the size of peeler logs has historically been around 40–60 cm diameter, but in the past few years the size of the input logs had declined to as low as 15–20 cm owing to the advent of more efficient peeling machines. Compared to the two other processes, however, the peeling process faces two fundamental constraints: logs need to be straight, and they need to be cylindrical in order to achieve a high output ratio. Among the three processes, chipping has the most flexibility in terms of input logs that can be used – essentially no constraints on the species, straightness or diameter.

In terms of product strength, the finished products in the form of sawn timber and plywood in the sawing and peeling processes are essentially structural products, with good structural and tensile strengths. Generally, in the chipping process, finished products (known as reconstituted panels) such as MDF and particle-board lack structural strength. However, continued process innovation in the US has improved strength, specifically for OSB, which is made from larger 'wood flakes' and can be used for beams and other structural building products.

Figure 41. Wood-based products business perspective



Source: various industry references

The challenges for tropical plywood in today's wood-panel market

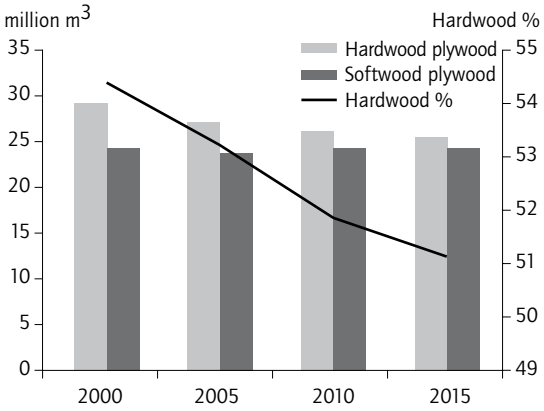
Substitution by reconstituted panel products such as particleboard, MDF and OSB

Robust growth in the production and consumption of reconstituted panels globally and also in Asia was spurred by a combination of factors, including the decline in large-diameter logs, technological advancement in the manufacturing process, the steady expansion of industrial forest plantations and escalating raw material costs. Growth in the output of reconstituted panels globally has had a corresponding negative impact on the production and demand for plywood, both hardwood and softwood, particularly in panel applications where structural strength is not a necessity. Given increasingly wider 'foaming and pressing' dimensions in reconstituted panel machinery, wider and thinner panels are now being produced, and these larger, thinner and wider panels are yet again displacing plywood, at a time when the latter is facing a steady decline in large-diameter logs for large panel production. A weakness of reconstituted panels vis-à-vis tropical plywood is in applications that require structural strength. But with OSB able to overcome the structural weakness factor, there is a risk that OSB will play a greater role in Asia, although there is no known OSB plant planned in Asia and product acceptance in Asia is still highly uncertain.

Competition from softwood and combi-ply

Tropical plywood has traditionally occupied a prominent position in the Asian wood industry, with softwood plywood occupying a relatively small market share. However, there is a clear trend towards higher production and demand for softwood plywood, particularly in Japan, where plywood producers have sought to diversify their source of log supply. The RWS Engineering 2004 report predicts that the hardwood plywood – predominantly tropical plywood – share of global plywood production will decline from about 55% in 2000 to slightly above 50% in 2015 (Figure 42).

Figure 42. Global production of hardwood and softwood plywood



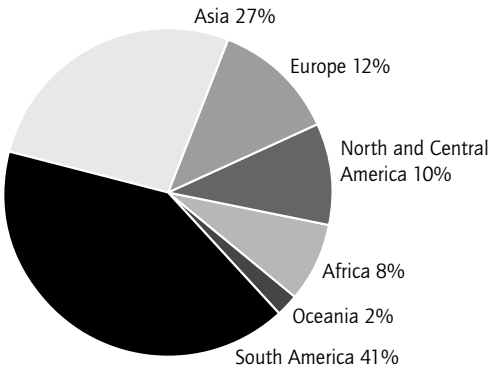
Source: RWS Engineering

Softwood plywood is inherently of lower quality compared to tropical plywood. As a result, consumers still prefer to use tropical plywood over softwood in applications requiring a smooth and attractive appearance. Of equal if not greater concern is the production of combi-plywood, where the face and back veneers are from tropical logs and the core veneers are peeled from softwood logs. In terms of strength, appearance and cost, these combi-ply products are fairly competitive with tropical plywood. The combi-ply producers in Japan rely on larch (a softwood) from Russia for the core veneers while utilizing tropical logs, primarily from Malaysia and PNG, for the production of the face and back veneers. In China, a similar phenomenon is taking place, whereby local producers use fast-growing poplar and Russian larch for the core veneers and tropical logs from Malaysia and okoume logs from Africa for the production of face and back veneers. To some extent, the substitution threat of softwood and combi-ply in the short term is held back by the recent sharp rise in freight cost (affecting the price of okoume) and also the general increase in prices of tropical, larch and poplar logs.

Unsustainable supply of low-cost raw materials

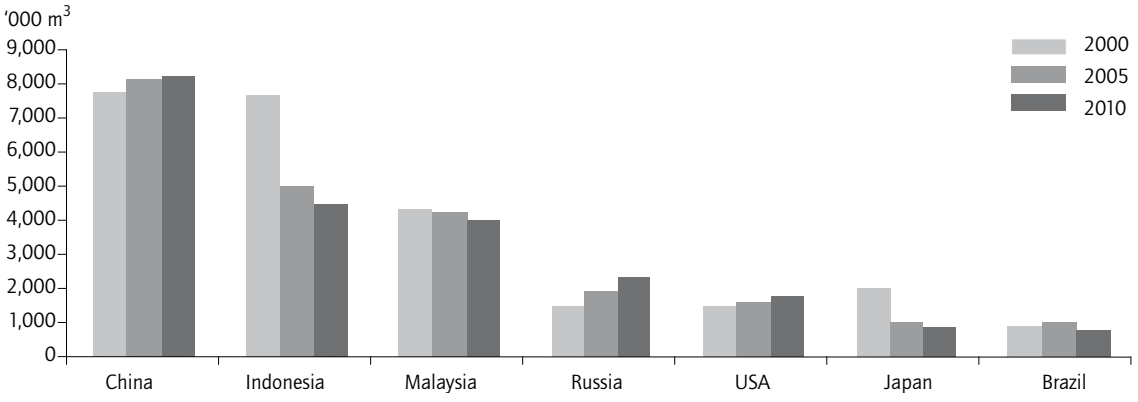
Even though two-thirds of the world's exploitable hardwood is located in Asia and South America, Asia is by far the larger of the two regions in terms of the production of tropical plywood, as shown in Figure 43.

Figure 43. Distribution of exploitable tropical resources by continent, 2000



Source: RWS Engineering

Figure 44. Major tropical plywood producers



Source: RWS Engineering

However, the production of tropical plywood in Asia has already peaked and is likely to decline, although the final outcome will depend critically on the long-term management of the region's natural forests, as shown in Figure 44. In Indonesia, the leading producer of tropical plywood in Asia, the supply of large-diameter logs from natural forests has been declining steadily and is likely to plateau in the near term. Likewise in Malaysia, log supply from natural forests is also flattening out. Supplies of small- and medium-diameter logs arising from land-clearing for plantations, particularly palm oil, are still abundant. However, supplies from conversion forests in both countries seem to have peaked. Furthermore, a lack of investment by domestic producers, particularly in Indonesia, into new machinery capable of peeling small- and medium-diameter logs means that the tropical industry is not fully exploiting this scarce and declining raw-material resource.

It is this overall constraint in log supply that will limit the Asian tropical plywood industry from returning to its peak production levels prior to the 1997 financial crisis. Besides the declining supply of large-diameter logs, tropical plywood producers are facing higher delivered-log costs, principally due to:

- the logging out of lower-cost lowland forests, with existing and future supplies coming mainly from remotely located forest concessions; and
- higher labour and raw-material costs.

Pressure of logistics as a result of high oil prices

Since 1997, tropical plywood prices have been trending down, bottoming out only in 2001. Currently, average prices are still below their pre-Asian financial crisis levels. On the other hand, during this period, freight costs have been rising steadily, particularly in the last twelve months as bunker prices rose in tandem with international oil prices.

For the two major Asian tropical plywood-producing countries, Indonesia and Malaysia, high oil prices have great implications. With a small domestic market, both countries are reliant on export markets for the uptake of their plywood production. As such, higher freight costs are becoming a key factor in determining the competitive position of the industry, especially vis-à-vis panel producers located in importing countries.

Analysts and consultants in the oil industry suggest that current high oil prices are likely to persist in the near term, and historical levels of US$15–20/barrel petroleum prices are unlikely to be revisited, at least not in the near term. As such, the current high logistical cost faced by the Asian plywood producers is not going to be a temporary phenomenon.

Research and developments of various types of products

In Europe, the main wood-panel products are MDF and particleboard, with plywood occupying third position. Particleboard dominates the consumption of wood panels, with a market share of about 63%. In second position, MDF has a share of 13% after overtaking plywood (market share 12%) in 2002. While the consumption of OSB is still small at 4%, this product is becoming more popular. In the US, OSB (consumption of 20 million m^3 per annum) has overtaken softwood plywood (consumption of 17.5 million m^3 per annum) as the preferred panel product. In both Europe and the US, much research and development effort has been channelled towards developing and refining the production process and to resolving constraints related to log and labour costs. Likewise, much effort has been put into research, development and marketing to diversify OSB applications. With good financial support, the lower cost of funds and a huge domestic market, reconstituted wood panels, including OSB, have led to the displacement of plywood, both hardwood and softwood, as the main panel product in the US and Europe. This phenomenon is also taking place in Asia.

The challenges for tropical plywood producers

Domestic market advantages

Although Japanese domestic plywood producers face high processing costs (logs are sourced from far-away countries, and they have a high-cost operating environment), they have continued to survive and occupy a major position in the domestic plywood supply chain. The endurance of these high-cost players lies in their ability to deliver tailored-made products and strong after-sales service. Domestic producers continue to supply a significant amount of the Japan's plywood consumption.

Similarly, in China, domestic market advantages exist for local plywood producers, thus allowing them to compete effectively with imported plywood. Domestic Chinese producers are able to provide prompt and smaller (rather than bulk as in the case of imports) quantity delivery. Local producers also have stronger distribution channels and wider market penetration.

The favourable import tax structure on logs vis-à-vis finished products combined with claimable tax benefits have also helped local producers to compete effectively with imports.

Logistic advantages among the various producers vis-à-vis the competitors

Indonesia and Malaysia, the two leading plywood exporters, still rely on exports for their plywood output; however, Indonesia, being ranking fourth in world population, has a greater advantage in its domestic market. Japan – with its developed economy – and rapidly growing China are expected to remain the two largest plywood markets in Asia for the foreseeable future. Therefore, local plywood producers in China and Japan have a natural logistical advantage over Indonesian and Malaysian plywood producers. Another example is Brazil, where domestic plywood producers possess a logistical advantage over Asian producers in terms of selling plywood into North America.

Sustainability of raw materials and cost

As discussed earlier, uncertainty in the long-term supply of logs is one of the main concerns for the plywood industry. The idea of SFM has been widely promulgated and promoted by various stakeholders in all the major producing countries, but actual implementation has not lived up to expectations. Illegal logging in Indonesia has been widely reported and is known to be taking place; in the past year, serious and effective clampdowns by the authorities have taken place. The effective clampdown on illegal logging is believed to be one of the factors leading to the recent strong rise in domestic log prices in Indonesia, which in turn has had a spill-over effect on international plywood prices.

While the clampdowns on illegal logging in Indonesia can be described as effective, the continuous massive logging activities in eastern Russia has resulted in abundant supplies of Russian larch and provided the foundation for the higher production of softwood plywood and combi-ply – competitors to tropical plywood – in Japan and China. To create healthy competition as well as to build an economic/cost advantage of one product over the other, the exploitation of raw materials needs to be checked against environmental considerations. When environmental factors are properly addressed, the prices of softwood logs from Russia are likely to be adjusted to reflect their real economic value, thus enhancing healthier competition.

Process efficiency and financial support

With the diminishing of large-diameter natural logs, production efficiency among the tropical plywood is increasingly crucial. For tropical plywood producers, the need to invest in new machinery capable of peeling small-diameter logs would appear to be a natural option. However, with many plywood producers, particularly in Indonesia, still wallowing in weak financial conditions owing to the Asian financial crisis, their ability to re-invest and re-engineer their production process is being hampered. Indonesia producers are also hampered by a lack of financing support from banking institutions, many of which have adopted a simplistic and overly negative 'sunset' view of the wood industry. In Malaysia, in contrast, particularly Sarawak, the large, integrated timber groups do not face such major financing constraints, although this is less so for the financially weak small and medium-sized plywood producers.

Government policy towards the industry

The forestry industry is highly regulated, with numerous regulations imposed along the process chain from the upstream forestry operation to downstream processing and ultimately to the sale and export of the products.

In Indonesia, tight regulations and laws are imposed to ensure that forest concessions are well managed, log extraction and delivery are properly conducted, payments of various forestry taxes (such as reforestation and royalty payments) are properly made, and export restrictions are complied with. Comprehensive forestry regulations governing both natural forests and plantation forests have been in place for a very long time in Indonesia. However, in recent years, there have been many changes in these regulations, partly because of changes in the governing political party, which in turn has created uncertainties in the timber industry.

Rising environmental consciousness

Worldwide environmental degradation has led to a growing environmental awareness among the general population. No industry has come under more intense scrutiny than the tropical wood industry. Under pressure from the public, both governments and NGOs have adopted aggressive stances towards forestry companies, pressuring them to adopt better forestry practices, eg managing forest concessions on sustainability principles and demanding proof of the legal status of wood supplies. While premium prices could eventually be expected from legally verified or

certified wood, the adoption and compliance of higher environmental standards means higher operating costs in the short term to the timber industry, including plywood producers. Beside higher costs, tropical plywood producers are facing the prospects of lower demand for their products, as aggressive campaigns by NGOs are dissuading European and US distributors/buyers and government departments from using tropical plywood in their projects.

Opportunities for tropical plywood producers in the world market

Manufacturing flexibility is a new winning competency

Compared to plywood manufacturing, the production of reconstituted panels (such as MDF) is less flexibility by virtue of the latter's high speed and volume and integrated production process. Lower production flexibility limits the plant's ability to produce a wide range of products in terms of product length, thickness and width. MDF plants are not able to produce tailored-made products, unlike some plywood producers in Asia, who have successfully re-configured their factories to cater entirely to customized orders. The lead time to make a change in the type of product being manufactured is also more rigid in an MDF factory compared to plywood. This flexibility in tropical plywood manufacturing is one of the keys for the industry regaining the market share it has lost to other panel products.

Steady improvement in peeling technology

As the supply of logs has declined, plywood machinery manufacturers have channelled research and development resources towards improving the efficiency of the peeling process. Logs as small as 20 cm in diameter can now be peeled efficiently, compared to 50 cm a decade ago. The cost of these increasingly efficient peeling machines has also declined. With most tropical plywood factories having excess drying and assembly capacity, the need to only invest in peeling capacity will mean lower unit capex costs during these later phases of expansion. The steady improvement in peeling technology will help ease the log-supply constraints faced by the tropical plywood producers.

High oil prices have increased MDF and OSB production cost

The production of reconstituted panels such as MDF and OSB requires the high consumption of energy and glue, both of which are sensitive to oil prices. The recent sharp rises in oil price have resulted in a corresponding increase in energy cost, particularly in Indonesia, Malaysia and Thailand, where governments are moving towards reducing fuel subsidies, and also on glue cost. In comparison, energy and glue costs as a proportion of total production cost is much lower in plywood production. With oil prices likely to remain high in the near term, tropical plywood producers will have some cost advantage in energy and materials over particleboard and MDF products.

Research and development in genetics, biotechnology, tree improvements and silviculture

These aspects have greatly improved the growth rates of industrial plantation trees. In the tropics, where trees grow throughout the year, these improvements in tree growth know-how will lead to greater long-term supply of low-cost but high-quality peeler logs for the tropical plywood industry.

Indonesian plywood and its potentials and strengths

Since 1997, the Indonesian plywood industry has experienced a downturn, with export volume falling from about 8 million m^3 in 1997 to 5 million m^3 in 2004. The decline in export volume is expected to continue slightly in 2005. For the first time in history, it is expected that exports of tropical plywood from Indonesia in 2005 will be lower than those from Malaysia and possibly China. US import statistics for January–December 2004 indicate that, for the first time, Indonesia's first-rank export position to the US was overtaken by China, with an export volume of 1.16 million m^3 at an equivalent average unit price of US$298.41/$m^3$, Malaysia, with a volume of 610,492 m^3 at an equivalent average unit price of US$326.71/$m^3$, and Russia, with a volume of 516,839 m^3 at an equivalent average unit price of US$318.75/$m^3$. Indonesia's export volume to the US was only 510,859 m^3, at an equivalent average price of US$413.35/$m^3$.

Despite the bleak assessments mentioned earlier in this report, one must not draw the conclusion that the outlook for the Indonesian plywood industry is all doom and gloom. On the contrary, the Indonesian timber industry possesses some positive attributes; specifically, the availability of a large quantity of low-cost plantation logs can potentially enable plywood

producers to regain their previously prominent position in the global tropical timber industry. If local plywood producers can tap effectively into this abundant raw-material resource, and combine it with the right machinery investment, they can become as competitive, if not more so, as any of the efficient regional players, boosting plywood production to pre-financial crisis levels of about 10 million m^3 per year.

Large quantity of plantation logs which are suitable for plywood production

It is not widely recognized that Indonesia has an abundant supply of plantation logs suitable for plywood production. Already a few plywood mills in Indonesia have successfully utilized these plantation logs, including *Gmelina*, *Acacia*, *Eucalyptus* and *Falcata* species, to produce plywood. This plantation-based plywood was initially sold domestically but now an increasingly quantity is being exported to overseas markets.

Plantation logs are competitively priced

With competitive prices (about 50–60% cheaper than logs from natural forest) and lower forest taxes (one-tenth of the reforestation and royalty fees on natural forest logs), plantation logs are substantially cheaper, even after adjusting for lower recovery rates and quality compared to natural-forest logs.

Availability of technology to process plantation logs

As mentioned earlier, some Indonesian producers have successfully adopted and adapted new processing technology to peel plantation logs. Some of these technologies are from:

- Japan, where the machinery is capable of peeling small-diameter logs with high productivity. The results have been quite satisfactory, and among those factories that have tried this machinery, some have re-ordered and bought additional capacities;
- Finland, where the machines are not only are able to efficiently peel plantation logs, some also incorporate drying and scarfing technology into the production process to produce good-quality plywood and laminated veneer lumber for the world market; and
- Taiwan Province of China and China, where the technology is similar to that in Japan but is lower-priced with lower specifications.

Successful developments in community-based industrial forest plantations in Java

A community-based forest plantation program that started about ten years ago on the island of Java has proven to be a win-win situation for the government, plywood manufacturers and local communities. These community-based forest plantations have successfully provided large quantities of Falcata logs to the timber industry, currently mainly in sawmilling but with an increasing quantity going to peeling/veneer mills for plywood production. There are opportunities to further expand these community-based forests as an avenue to providing a long-term supply of raw materials. The success of community-based industrial forest plantations in supplying millions of cubic metres of logs annually arose from successfully leveraging the following factors:

- the existence of farmers staying and living near their farmland with a willingness to plant these fast-growing species;
- the introduction of processing technology enabling the conversion of fast-growing trees into higher value-added products; and
- most importantly, the economic benefits and development opportunities that these plantations are providing the local community. There are plenty more under-utilized, willing and hard-working farmers ready to repeat this Java success story across all of Indonesia.

Conclusions

The tropical plywood industry, which has declined steadily since the Asian financial crisis, continues to face numerous challenges. However, it is incorrect to conclude that the outlook is bleak. On the contrary, the Indonesian timber industry possesses some positive attributes; specifically, the availability of a large quantity of low-cost plantation logs, if carefully exploited, could enable plywood producers to regain their previously prominent position in the global tropical timber industry.

The re-emergence of the Indonesian plywood industry would be enhanced and accelerated by effectively addressing the problem of illegal trade. Smuggling has caused an undesirable distortion of the world wood products' market and surely damaged the sustainability of forests. Indeed, law enforcement is domestic; however, is it not as well the noble responsibility of the world community to render its significant positive support by addressing and curbing illegal trade or smuggling?

Commercial trade barriers for tropical plywood*

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Commercial trade barriers related to timber products

Tariff trade barriers (TTBs)

- Impacts of the Uruguay Round
- Tariff rates for processed timber products have been declining
- Tariff escalation on value-added timber products
- Plywood has not been affected by TTBs since Uruguay Round

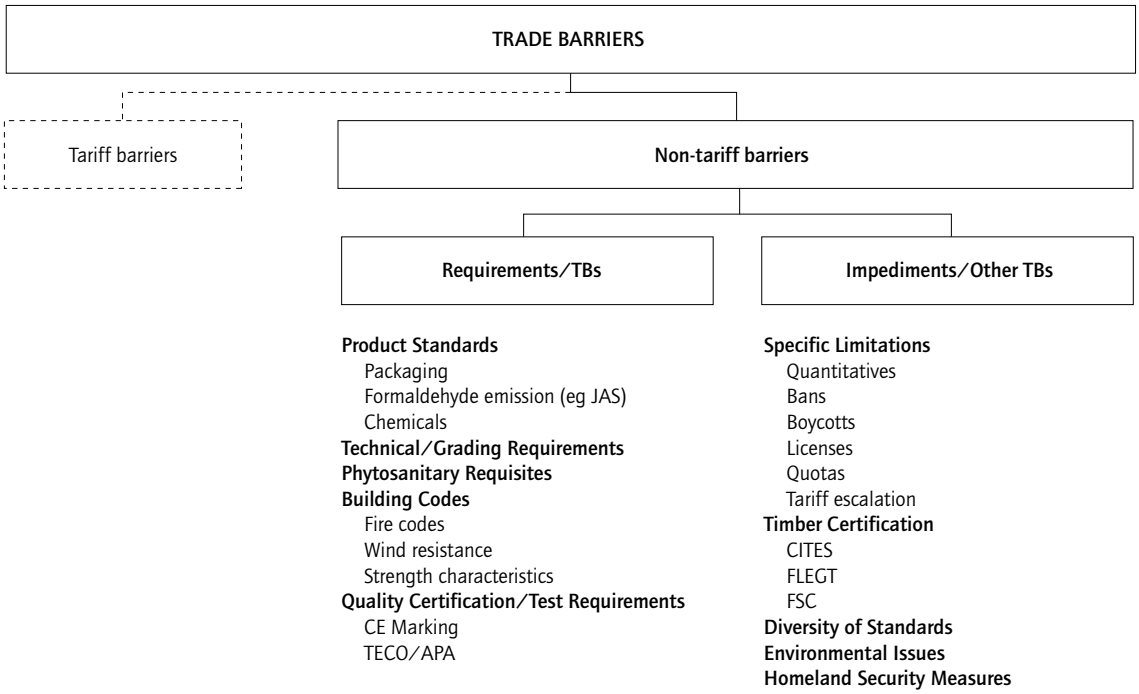
Non-tariff trade barriers (NTTBs)

- NTTBs have gained importance
- Technical barriers to trade
- Sophisticated market impediments
- NTTBs affecting international tropical timber trade

Impacts of NTTBs on the tropical plywood trade

Additional costs

- Reduction of competitive position of tropical plywood in the markets
- Less opportunity for small and medium-sized enterprises trading tropical plywood in the international market
- Low tropical country expertise for meeting market requirements
- Market producers are dependent on international expertise and services



** Text prepared by the editors based on a Powerpoint presentation given at the conference*

Table 22. Selected NTTBs for tropical plywood in major importing markets

Importing market	NTTB type	Specific measure
US	Product standards/ grading requirements	Hardwood Plywood and Veneer Association*
		Tropical plywood for structural applications requires grade stamp
	Technical regulations	ISPM 15
		Homeland security
		CTPAT
		Leadership in Energy and Environmental Design
EU	Product standards/ grading requirements	CE Marking
		Tropical plywood for structural applications requires CE mark
		Formaldehyde emissions
	Technical regulations	ISPM 15
		'Green' procurement procedures
Japan	Product standards/ grading requirements	Japan construction regulations
		Formaldehyde emissions
	Technical regulations	'Green' procurement procedures

* *No offshore tropical plywood producer is a member*

Brazilian initiatives to overcome NTTBs for tropical plywood

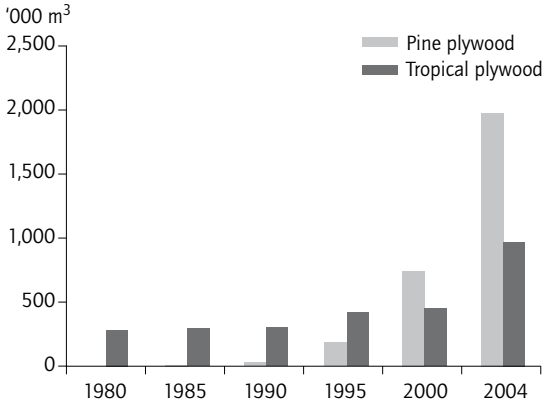
Importance of international trade of tropical plywood for Brazil

- Brazilian tropical plywood exports
- Plywood represents 20% of Brazil's solid-timber product exports
- 8.8% of the international tropical plywood trade

Plywood represents 20% of Brazil's solid timber products exports and 8.8% of the international tropical plywood trade. The major commercial trade barriers (CTBs) faced by Brazilian tropical plywood exporters are:

- there is a large variety of standards / building codes;
- CE marking (EU);
- voluntary product standard ps2-92 (US);
- compliance on formaldehyde emissions;
- ISPM 15; and
- environment-related issues.

Figure 45. Brazilian plywood exports, 1980–2004



The major responses are company initiatives, species diversification, and replacement of traditional tropical species (to meet environmental concerns):

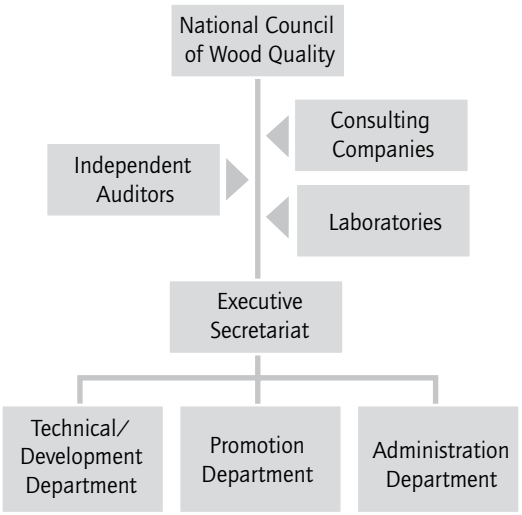
- improve SFM;
- reduce raw material (roundwood) costs;
- market diversification;
- Brazilian Association for Mechanically Processed Timber (ABIMCI) initiatives;
- National Program on Wood Quality (NPWQ); and
- Brazilian Program of Forest Certification (CERFLOR).

The following scheme shows the evolution of the NPWQ; the coverage at the national level (PBQPH – *Programa Brasileiro de Qualidade e Produtividade na Construção e do Habitat*), at the global level: EU (CE marking), US, Japan/Asia. Structure and remarks: 15 people are working full-time on the certified product mark.

1999	Launched NPPQ – only pine plywood
2002	Enlarged Scope – pine plywood – tropical plywood – SPWP
2003	BM Trada Agreement – ratified body
2004	BM Trada Audit first companies certified (CE2+) – plywood for structural use
2005	71 companies under the NPWQ program* 33 certified companies (NPWQ)* 9 certified companies (CE2+)

NPWQ

The NPWQ is a work in progress; it is institutionalized at the national level (National Institute of Metrology, Standardization and Industrial Quality – INMETRO) and has international accreditation. It provides



technical support, in-company, research and development, laboratory testing, enlarging operational agreements, national and international promotion. It has led to an improvement in the image of timber industry and an increase in consumption of timber products.

ABIMCI is working on CERFLOR's mutual recognition. CERFLOR is a Brazilian program for forest certification. ABIMCI supported the development of criteria and indicators for the sustainable management of Brazilian tropical forests through:

- pilot tests;
- seminars/workshops;
- professional and auditor training; and
- manual publication.

Final remarks

NTTBs for tropical products will predominate and increase. Transaction costs will probably increase, affecting the competitiveness of the tropical timber industry. Small- and medium-sized enterprises will be more affected. In coming years, NTTBs will be focused on green procurement.

- Port security/increased shipment inspections
- Tropical plywood producers have a poor track record in:
  - staying current with changing market requirements
  - being proactive in responding to the changes

Most governments in tropical timber-producing countries are not aware of existing and potential CTBs and their impacts. There is no specific strategy. Better coordination between the private sector and government is needed to overcome NTTBs. There are only a few exceptions (Brazil, Malaysia, others).

Competition and tropical plywood substitution by other products

Stephen Lau
MPMA & Sarawak Timber Association

This paper looks at the major global panel markets to understand the balance between them before focusing on the largest tropical hardwood panel market for Asian manufacturers – Japan. The paper examines the grand competition from China and looks into future possibilities.

Tropical hardwood plywood supplies only 10% of world wood-panel demand; the competition and substitution from the 'giant' softwood manufacturers (which constitute 90% the market) will no doubt be enormous. However, there must be common ground between the two faces of the same coin; the real competition to the tropical hardwood plywood industry is from within.

Substitution is always possible by anything substantially cheaper; it can also be caused by incorrect product information perceived by the market, a problem that tropical timber is increasingly facing. However, timber is itself a very competitive and flexible material that satisfies the five human senses and is easily disposable and completely recyclable. The demand for wood products is growing all the time; since there is such a huge demand for wood globally, we confine our definition of substitution to the issues of quality, quantity, suitability, availability and price demand in the market. This paper points out that this shift according to the requirements of the market will be necessary for the industry to remain viable and relevant.

An attempt to analyse the global market demands for panel timber products is shown in Figure 46.

Figure 46. Total Europe market – supply vs demand

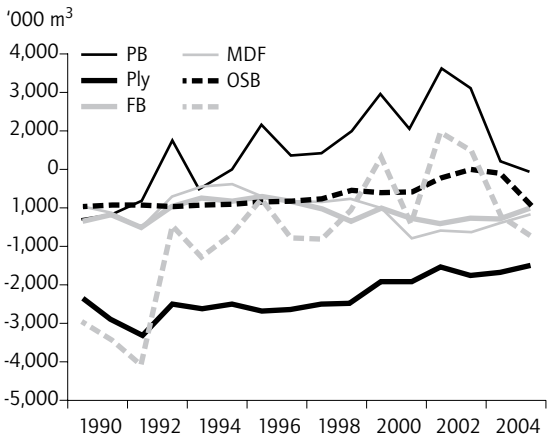
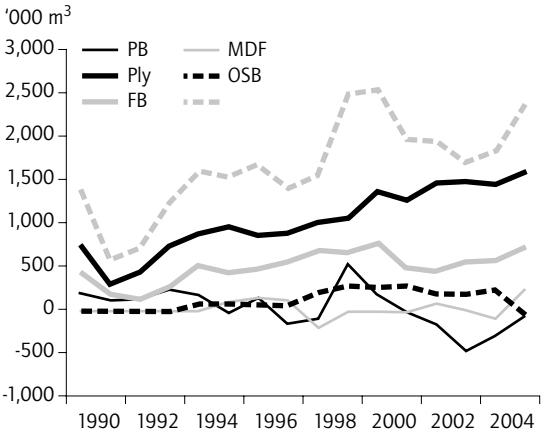
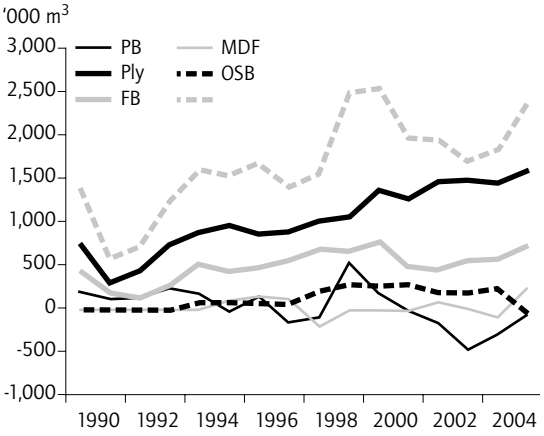


Figure 47. Eastern Europe – supply vs demand



Based on the information in Figure 47, there is a shortage of about 1.5 million m^3 of plywood. This will need to be supplemented by imports from other regions, including Russia, South America, North America, Asia, Africa and China.

Figure 48. South America situation – supply vs demand



South America has a surplus of about 1.4 million m^3 of plywood, which is mainly exported to North America and Europe. Brazil and Chile export about 975,000 m^3 of softwood plywood to Europe. About 218,000 m^3 of Russian softwood plywood trade flows into Western Europe. The balance of about 400,000 m^3 of tropical hardwood plywood is shifted from Asia into Europe. This makes up the 1.5 million m^3 shortage. Asia also traditionally exports a similar amount to the UK.

Figure 49. South America supply vs demand

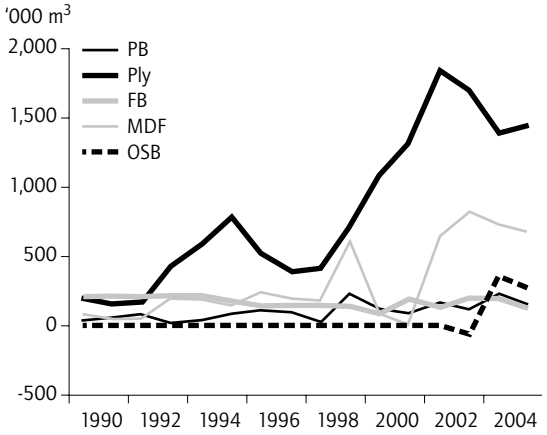
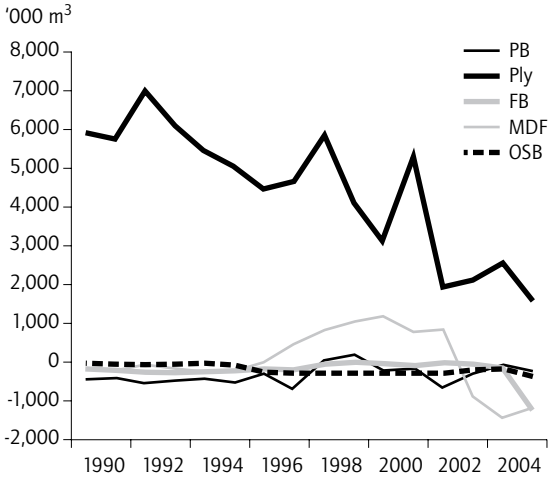


Figure 50. Asia and Oceania supply and demand, excluding China



Note that the 1.5 million m^3 surplus estimated for 2005 dropped from 2.5 million m^3 in 2004 due to the reduction of production expected in 2005. Of the 2.5 million m^3 surplus in 2004, Asia exported about 800,000 m^3 to Europe and the UK and 700,000 m^3 to China. The balance of the surplus was to the US and the Middle East.

Figure 51. Japan tropical hardwood plywood market

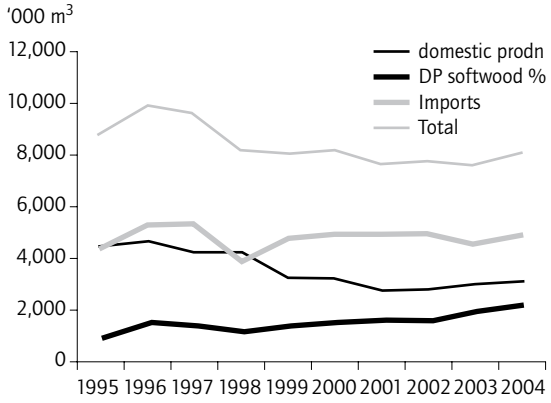
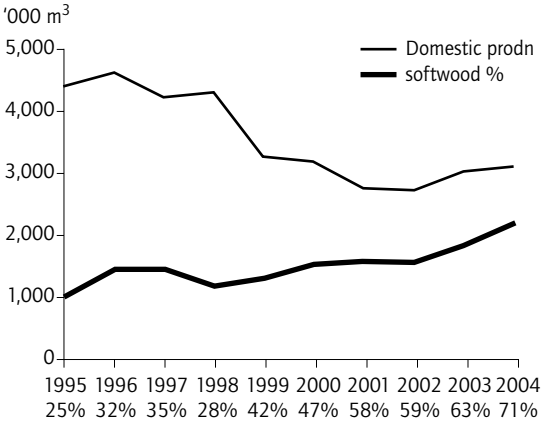


Figure 52. Japan domestic production softwood trend



The Japanese government subsidizes and sponsors domestic mills heavily on machinery investments for processing cedar, which is also supplied at very low cost. The cost of cedar is believed to be about US\$35/m^3. Some have reported that Japanese mills producing cedar plywood are competitive even at the US\$240/m^3 level. The increased capacity creates excess inventory and domestic prices have plunged 30% over the last twelve months.

Because of this, Russian larch log prices dropped, intensifying competition all round. This is a very alarming picture, as we know little about the Russian supply situation.

Contrary to the common belief that the softwood market does not affect hardwood market pricing, data show that a drop in softwood structural panel prices affects hardwood structural panel (SP) prices, even though production costs have gone up over the years. It has also limited growth in the prices of concrete panels (CPs), which are mainly imported. Prices of floor bases (FBs), which are also mainly imported, are believed to be linked to CP pricing.

But a conclusion can clearly be drawn from the data that there is an over-supply of tropical hardwood CP/FB and SP. World timber production should gradually move towards a sustainable level; therefore, if materials are from legitimate sources then it is we only need to address the market issue. It is hoped that government-to-government cooperation and the exchange of import and export information will help eradicate illegal trading.

The above has created an overstocking situation in Japan and weakens the market. Stock levels in June were reported to be at 330,000 m^3, compared to 200,000 m^3 in 2003.

Figure 53. Japan sale price

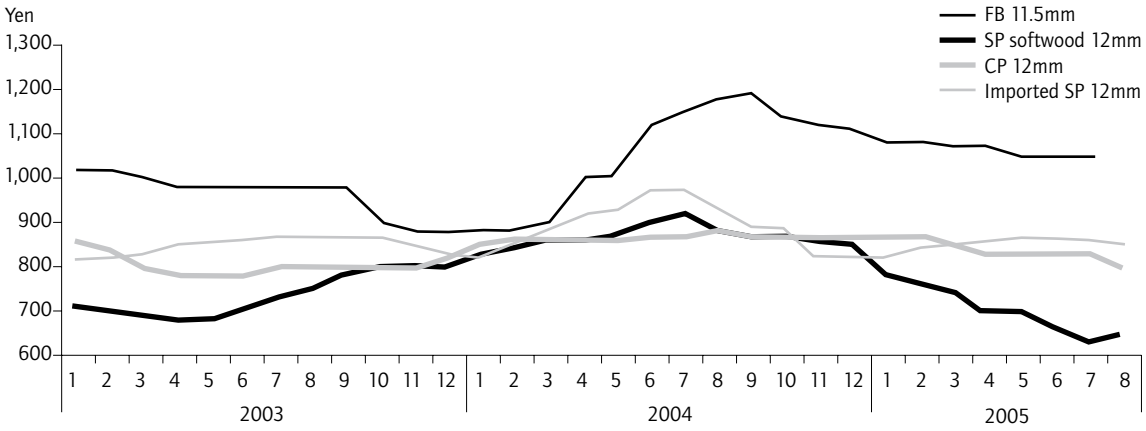
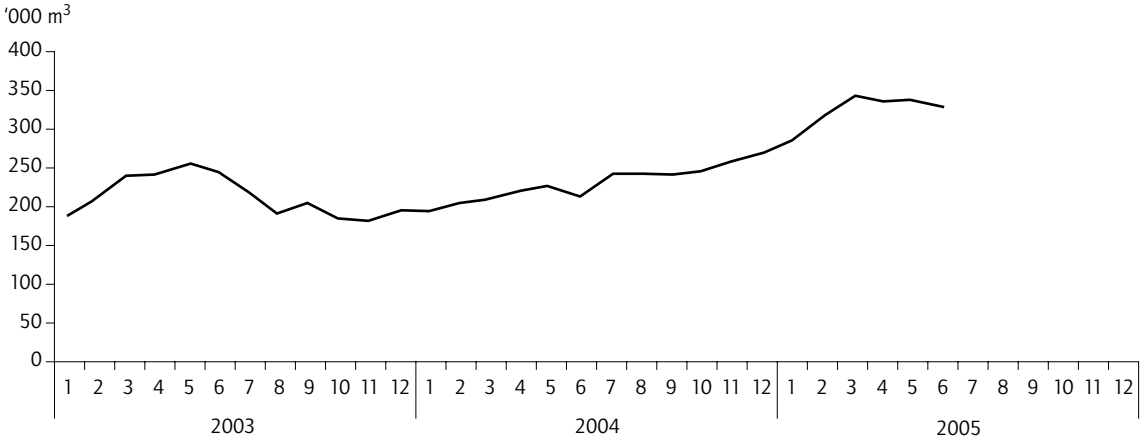


Figure 54. Japan common plywood stock



The US is reported to have 17 million m^3 of panel demand. During the economic turmoil of 1997, the weakening of Asian currencies induced a short-term export benefit, triggering a rush to exchange goods for foreign monies. This resulted in the collapse of world tropical hardwood panel prices. Malaysia suffered from this and the industry watched as the pendulum swung from one extreme to the other; at its worst, the price of tropical hardwood panels in Malaysia dropped to below the raw-material replacement value. However, it was noted that large temperate panel-consuming countries like the US did not substantially increase tropical hardwood plywood imports. This implies that regional protectionism is strong in developed countries.

Malaysia and Indonesia combined export less than 10% of US panel demand and continue to face stiff competition from South American production.

The important lesson from the economic turmoil was that tropical hardwood prices can drop below break-even levels due to the dependency of the producing countries (mainly from the Third World or developing nations) on the timber industry. Understandably, this will lead to a worsening of resource depletion.

The further opening up of the US market will no doubt help to maintain the true value of tropical hardwoods and a world balance in the world timber supply and demand equation.

China, on the other hand, presents a totally different scenario.

- In 2002, China imported 24.33 million m^3 of logs, of which 14.81 million m^3 were from Russia
- In 2003, China imported 25.46 million m^3 of logs, of which 14.37 million m^3 were from Russia

Table 23. China imports by kind of log

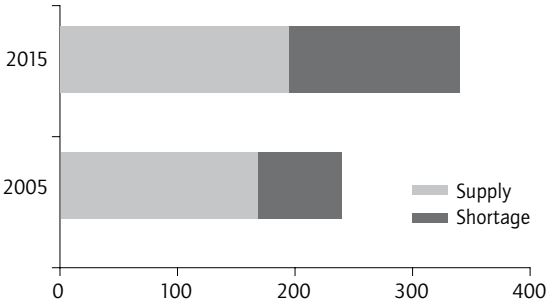
Kind of log	2002 '000 m^3	2003 '000 m^3
Conifer log	15,789	14,974
Tropical log	2,188	1,022
Broadleaf log	6,358	5,752
Others	2	45
Diff	0	3,663
Total	**24,337**	**25,456**

Table 24. China imports by country

Country	2002 '000 m^3	2003 '000 m^3
Russia	14,806	14,367
Malaysia	2,121	2,931
New Zealand	1,406	1,920
PNG	1,128	1,377
Gabon	941	1,087
Burma	605	863
Equatorial Guinea	344	510
Indonesia	250	259
Congo	250	242
Solomon	162	178
Others Diff	2,324	1,722
Total	**24,337**	**25,456**

- In 2003, China also imported 5.51 million m^3 of lumber, 975,000 m^3 of MDF, and 797,000 m^3 of plywood
- This makes a total wood import of 32.74 million m^3
- Veneer import figures were not available at the time of research
- Chinese wood demand, on the other hand, is reported by 5th Investigation data on national forest resources at 230–240 million m^3 (excluding firewood). Less the domestic supply of 169 million m^3, China still has a deficit of 60–70 million m^3, which needs to be met by imports or supplemented in other ways
- In 2003, China imported about 33 million m^3 of wood, still leaving an outstanding demand of about 40 million m^3 to be sourced elsewhere. This may lead to the illegal depletion of forest resources
- Chinese demand for 2015 is predicted to be 330–340 million m^3 (excluding firewood). Domestic forest supply is only forecast at 195 million m^3, creating a shortage of 130–150 million m^3 of wood

Figure 55. China domestic forest supply (million m^3)



The above forecast is based on a timber consumption level of 0.19 m^3 per capita compared to the world average wood consumption of about 0.55 m^3. If one assumes a modest level of 0.4 m^3 of China wood consumption per capita in 2015 (considering substitution and higher wood usage efficiency) and with a population of 1.5 billion people, this will give a staggering demand figure of 600 million m^3 per year. The gap will then be beyond apprehension.

So why is the volume of imported tropical hardwood plywood so small, and the market so weak?

- 40 million m^3 of unaccounted wood supply is a large deficit of raw material supply. It leads us to believe that there may be 'alternative' cheap wood sources confusing the market and weighing down on the industry
- China is not only using this unaccounted wood supply to compete with imported plywood, but also internationally. The vast disparity in prices is creating substantial confusion in both the domestic and international markets. This is creating a revenue loss for all concerned. It is also done at the expense of depleting natural resources in China, aggravating an already difficult situation in the country. China should use its advantages to encourage quality and further value-added processing and nurture future potential
- From official log and veneer import figures, it is estimated that China will produce about 4 million m^3 of tropical face plywood, 3 million m^3 of which will use the wood supplied domestically. There is nothing wrong with this, except that some of these logs or veneer, or even plywood, may be from illegally sourced supplies
- The problem with illegal activities is that they provide only short-term benefits. The avarice they represent will grow in profusion, and because the passion and prejudices do not coincide with wider interests, in the longer run they will destroy the

economy and the industry in more than one way. Responsible industrial members have a duty to stop this, and it can only be done through official collaboration in the collection and analysis of data and encouraging at least minimum transparency in the international trade

- With its huge demand and very limited raw materials, China should continue to enjoin its industry to focus on the development of value-added and further processing
- China will be a direct threat to the domestic Japanese panel product industry. It could use a supply of tropical hardwood plywood, further processing it for export to Japan. This is a likely future trend
- China should encourage BP imports (which are the base material for further processing) by abolishing its import and sale taxes so that the local industry focuses on further processing. This will be in line with the national policy. By so doing, it will reduce deforestation and the exploitation of forest resources in the country, and help the country timber industry to focus on its intended path, which is value-added processing

Conclusion

Despite the unfair advantages of the replacement forest management method practised in temperate countries, constituting 90% of the global wood supply, over the less cost-effective selective cutting forest management method, practiced mainly in tropical countries, the supply will stabilize when the former reaches the maximum land availability. This is possible if the world can look into the Russian equation, where no forest management is known to have been practised.

If the raw material is limited, then the product will be limited, although the growth in each category may vary.

The differential growth in each timber category, eg particleboard/fibreboard/OSB/MDF/plywood, or a combination of these, is necessary for the timber industry to remain relevant as a whole, through product change or improvements in efficiency.

The competition between softwood as a timber giant (90% of the global market) and tropical hardwoods (mainly developing or Third World countries) will remain. As long as it is legally, responsibly and fairly done, each should have their own market to look after, guarded by limited raw-material supply (which is enforced by proper forestry management systems and international collaboration in information and transparency).

Competition and substitution will be coming from within; we are destroying our own resources to dump on our own market.

Both tropical hardwoods and softwoods should have organizations to watch global and deviating practices, regardless of their origin, from America, Russia or Africa, and compromise with a common recognized system that takes local knowledge into consideration.

The tropical hardwood industry in our region is still relatively immature. We need strong associations to help in organizing and disseminating market information and to create transparency in the trade. Regional governments should assist representative associations to organize themselves so that they will be able to structure and formulate their strength and strategy for fairer market share. A proper association structure will help to maximize the value of its industries and minimize wastage of natural resources. Breaking down associations such as APKINDO to mere fellowship organizations (of which MPMA and the Sarawak Timber Association are examples) opens up these relatively young industries and subjects them to higher-level marketing politics.

We also believe that setting up a public exchange will help to achieve some of these goals in the right direction.

The formation of the APKINDO-MPMA Marketing Group (AMMG) in February 2001 in Tokyo brought into being a strategic alliance between Malaysia and Indonesia, the latter still being the largest manufacturer of hardwood plywood in the world and traditionally Malaysia's biggest competitor.

The objectives of the AMMG were to undertake joint efforts in market intelligence, formulate joint marketing strategies and promote market stability for the benefit of both the buyers and the manufacturers.

It is regrettable that such a noble attempt at achieving a higher-level marketing and political alliance that could form the basis of further collaboration did not progress from its initial onset. As the Honorary Secretary of the MPMA and Chairman of the Panel Product Committee of the Sarawak Timber Association, I sincerely hope and appeal to our counterparts to work on common ground, including involvement from the Japan Lumber Importers Association and JPMA, and any credible Chinese associations, for the betterment of the industry, to ensure that it remains viable and relevant.

Why Chinese plywood is so competitive*

Shengfu Wu, Director
Green Panel Consulting, China

Why China developed plywood

China's economy has been developing rapidly, and local markets are booming. In addition, the following factors contribute to a favourable context in China for plywood manufacturing:

- increasing world market demand for plywood (and for exports from China);
- investors are moving into China;
- China has joined the WTO;
- plantation supply of raw materials – especially poplar wood – is booming; and
- China has huge labour force advantages.

New types of plywood, for example fancy and combi-ply, with their corresponding processing methods, were developed in China.

Specifications for plywood

Specifications for quality standards of plywood manufactured in China are being improved and are under further development. In the EU or North America, specifications are based on different functions and applications. The research work on the utilization of plywood in China lags far behind, but Chinese production quality labels and plywood brand names are increasingly becoming known and used on the market. Differences in the specifications and quality of product standards between China and Western countries are obviously still significant but a lot of effort is being put in by the Chinese to further improve plywood specifications.

Raw materials

The poplar plantation area of China is the biggest in the world, with a yearly harvest of over 50 million m^3, half of which is used for veneer production. The annual growth rate of the poplar plantation area exceeds the present level of harvesting. Diameters can reach 30 cm within 6–8 years. Wood density is about 0.4 g/cm^3; dozens of new clones are being introduced yearly and log quality is improving steadily. Further scientific improvement work is also ongoing for *Eucalyptus* plantations and the agriculture forests.

Plywood processing

Processing technology and machinery are not advanced but are remarkably simple, robust and useful. They work well in the context of the plywood manufacturing process in China, where big logs are steadily being replaced by small-diameter plantation logs. In addition, small diameters and lower quality logs, which in Western countries would be used for particleboard, are being used for plywood in China.

Processing and plywood machinery is very simple and requires high labour inputs, as can be seen in Figure 56.

Figure 56. A small, family-operated lathe

** Text prepared by the editors based on a Powerpoint presentation given at the conference*

Product quality

The State has put a lot of effort into improving quality, but Chinese plywood is not as good as plywood made, for example, in Finland. However, present production quality standards meet most of the domestic market requirements and prices are very competitive.

The most frequent quality problems with Chinese plywood include:

- formaldehyde emissions too high;
- (face) veneers are thinner than they should be;
- moisture content is too high; and
- poor-quality core veneer.

Frequent quality problems with fancy plywood include the following:

- formaldehyde emissions too high;
- internal bonding of face layer too low ;
- tearing strength not good enough;
- thickness of the panel is thinner then nominated;
- face layer splits or changes colour during/after use; and
- face veneer too thin, even <0.1 mm after sanding.

Management

Management in most mills is rudimentary, and management costs in privately owned mills are very low. The management staff of private mills is kept to an absolute minimum, and most small mills have only one manager. This further adds to the low cost of plywood manufacturing in China.

Labour cost/quality

The cost of labour in China varies. The cost of managers is higher than in Western countries and averages for a year's salary of around half a million RMB as normal. The cost of worker's labour is much lower than in Western countries, with a monthly salary of 1,000 RMB the norm (US$1 = RMB8). In addition, Chinese labour is diligent and very hard-working. Chinese workers are more disciplined and easier to manage than in other countries.

Conclusion

The Chinese plywood industry is still growing and is evolving from producing plywood only suitable for domestic use towards increasing the production of higher-quality plywood for international markets. The quality of Chinese plywood is improving step by step and Chinese plywood will become more competitive over time.

Trends in tropical plywood prices

Jairo Castaño, MIS Coordinator
ITTO

This paper presents price trends for benchmark tropical plywood products from Southeast Asia and Latin America. It shows that after a long period of decline that began during the Asian financial crisis in 1997, prices for tropical plywood products largely recovered from mid 2003 due to growing log supply problems (in Indonesia and Malaysia), strong housing markets in the US and UK, and bottlenecks in shipments. However, prices for most of these products remain below pre-crisis levels due to growing substitution by softwood plywood and other panels and stiff competition from Chinese plywood.

Southeast Asian (89%) and Latin American (9%) exporters dominate the trade of tropical timber by ITTO producers. This paper presents trends in real FOB prices for various grades and thicknesses of plywood products from these regions. The prices presented are reported by the ITTO MIS through the Tropical Timber Market Report (TTMR), which is published every two weeks[5].

The ups and downs of Southeast Asian plywood

For Southeast Asian plywood, the focus of this analysis is on Malaysian prices, which are closely correlated with Indonesian prices.

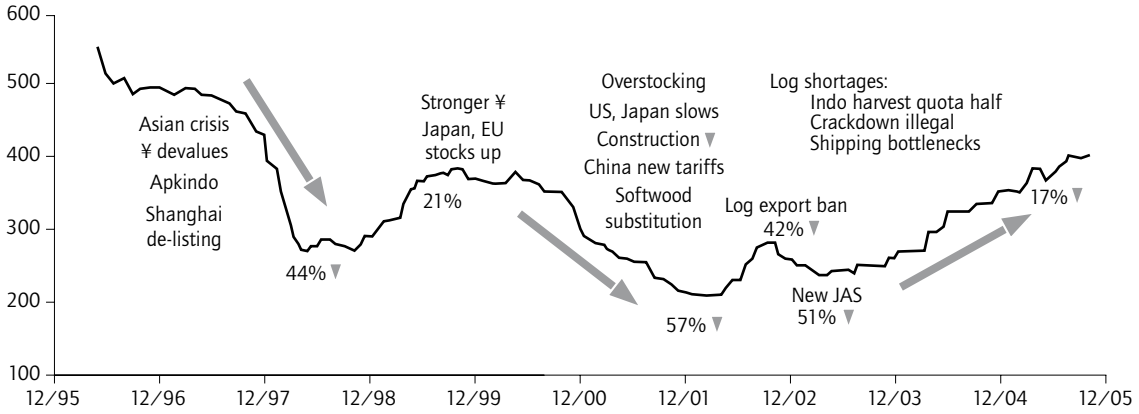
In January 1997, Malaysian and Indonesian BB/CC moisture-resistant plywood grades were selling for about US$490/m^3, US$445/m^3 and US$375/m^3 nominal for 2.7 mm, 3 mm and 6-18 mm thicknesses, respectively. But by May 1998, the prices for these products had plunged by half to about US$245/m^3, US$220/m^3 and US$200/m^3, all nominal record lows. Prices fell sharply in this period due to the impact of the Asian financial turmoil and the sharp depreciation of the yen. This was compounded by the collapse of Indonesia's APKINDO, which played a price leadership role, and the de listing of the plywood futures contract at the Shanghai Commodity Exchange in 1997.

Southeast Asian plywood export prices recovered in late 1998 and 1999 due to a stronger yen, active demand for thin plywood in Chinam and log shortages faced by producers in Malaysia. During this time, consumers in Europe and Japan jumped to secure stocks before prices went up further, resulting in some overstocking.

Prices reach record lows

Partly as a result of overstocking in some consumer regions, prices of Southeast Asian plywood slipped again in 2000–2001. This was compounded by depressed construction sectors in Japan, Korea

Figure 57. FOB prices for Malaysian plywood



[5] *The MIS* Tropical Timber Market Report *is published with the aim of improving transparency in the international tropical timber market. The* report *is free of charge and subscription can be made online (www.itto.or.jp).*

and other Southeast Asian consumers as well as in Germany, a change of import tariff structures in China favouring logs over plywood imports, and growing substitution by softwood plywood in the construction sector and by other panels in furniture and joinery end use markets. These factors conjoined in such a manner that prices for Southeast Asian plywood did not see the post crisis recovery of other tropical timber products. Southeast Asian plywood reached new record lows of US$213, US$193 and US$158 for 2.7 mm, 3 mm and 6–18 mm thicknesses in early 2002. These prices were 16–26% lower than the lows of May 1998.

Prices of Asian plywood firmed from the second quarter of 2002 after Indonesia re implemented a log-export ban, which particularly affected Japanese and Malaysian ply mills using cheap logs. Nominal prices of Malaysian BB/CC moisture-resistant plywood hovered at around US$240/$m^3$, US$205/m^3 and US$158/$m^3$ for 2.7 mm, 3 mm and 6–18 mm thicknesses, respectively, for most of 2002 and early 2003.

In mid 2003, plywood prices were affected by the introduction of new standards (Japan Agricultural Standards – JAS) for low formaldehyde emissions on plywood for structural uses. Low prices reflected some initial delays in compliance (especially in Indonesia) by Southeast Asian tropical plywood manufacturers.

Prices recover due to sharp log shortages

In 2003, Indonesia halved its annual harvest quota for natural timber from 12 million m^3 to 6.89 million m^3 and further reduced it to 5.74 million m^3 in 2004 as a measure to control illegal logging. Prices for 2.7 mm, 3 mm and 6–18 mm panels rose steadily due to aggravated shortages in raw-material supply. In 2005, Indonesia reduced the annual harvest quota to 5.45 million m^3, driving plywood prices to new post-1997 highs. Prices for 2.7 mm, 3 mm and 6–18 mm panels reached US$408/$m^3$, US$388/m^3 and US$330/$m^3$, respectively, in September 2005, six-year highs but still 12–17% below pre-crisis levels in January 1997.

Recent price gains also reflect a crackdown on illegal logging in Indonesia, the strengthening of the housing market in Japan and bottlenecks in shipping capacities. Despite tight supply, sharper price rises have been prevented by subdued consumer spending and deflation in Japan and mounting concern over illegal logging in some major markets.

Current situation: tight supply and fierce competition

Tighter enforcement of harvesting rules and resource constraints in Malaysia is putting added pressure on the log supply in Southeast Asia. Meanwhile, in Indonesia the plywood sector has been scaling down production and exports. Supply is now less continuous. Production costs have been pushed up by soaring fuel prices for ply mill generators, glue and land transport.

Indonesia's market share in Japan has shrunk to less than 43% in 2005 (and is still declining), while Malaysia's has grown to 47%. The Japanese market is shifting more to temperate hardwood and softwood panels due to lower supply and rising prices. China has taken advantage of this situation by promoting its combi-ply products (eg okoume, meranti or bintangor faces with poplar/other cores). Chinese combi-ply has been successful in substituting not only Indonesian but also Latin American plywood in the EU, US and Japan.

China is currently the largest hardwood plywood supplier to the US and the third-largest in Japan and is overtaking Southeast Asia in the EU. Prices for Chinese combi-ply are reported at levels 25–39% cheaper than Indonesian material, although quality is an issue.

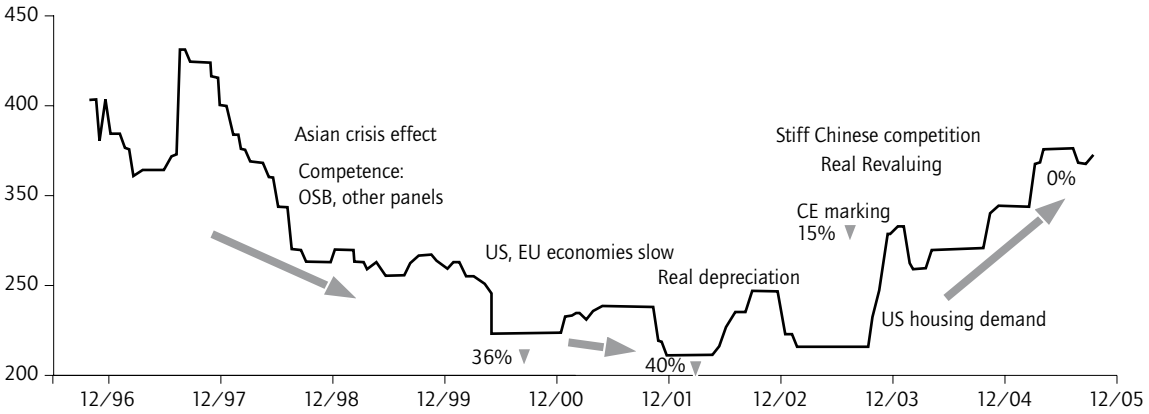
Brazilian plywood prices declined more dramatically

Latin American plywood prices showed an even more dramatic decline in 1997–2002 than that observed for Asian plywood. Prices of white virola (5.2 mm), the most valuable Brazilian plywood export species, declined steadily until the first quarter of 2000 to US$230/$m^3$ nominal, a record low, hovered around that level for most of 2000 and 2001 and declined sharply again in late 2001 to US$215/$m^3$, a new record low for this species. Prices were driven down by the low price of Asian plywood resulting from the Asian financial crisis and APKINDO collapse, and strong competition from Brazilian OSB manufacturers.

Prices recover from 2004

Prices for white virola (5.2 mm) recovered slightly in the third quarter of 2002 but fell back to US$230/$m^3$ in late 2002 due to a depreciation of the Brazilian real. However, from 2004, Brazilian plywood saw significant increases in exports to the US and UK due to booming housing markets and very competitive prices as a result of relatively low

Figure 58. FOB prices for Brazilian white virola plywood



operational costs and the devaluation of the real. Prices retreated in early 2004 as Brazilian exporters adjusted production to the new requirements of the EU's compulsory CE marking standard for the manufacture of structural plywood. The growing but still insufficient supply of CE-marked product also contributed to increased white virola plywood prices later in the year.

Growing competition from Chinese products

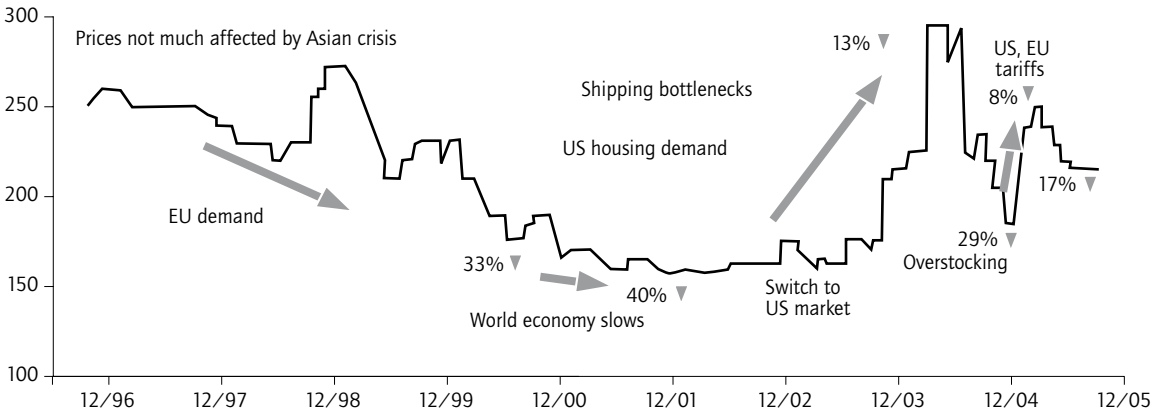
Brazil's real has strengthened against the US dollar in 2005, unfavourably affecting Brazilian exporters. This situation is making domestic manufacturers concerned about high costs and margin reductions. White virola (5.2 mm) was trading at US$355/m^3 in September 2005. Brazil is facing stiff competition from Chinese plywood exporters, who have displaced it from key market segments in Europe and the US. With a more favourable exchange rate, Chinese plywood has managed to make inroads into the international market at more competitive prices.

Elliotis pine plywood prices decline, but not as much

Prices for Brazilian elliotis pine plywood (15 mm), included here for comparison purposes, were less severely affected than Brazil's tropical plywood exports by the 1997–98 market turbulence. However, prices were stuck at around US$162/m^3 between 2000 and mid 2003 due to weak demand in Europe.

By mid 2003, the strength of housing demand in the US had started to impact on demand. Brazilian exporters began to switch from Europe to the US and prices began to move up. In the first quarter of 2004, Brazilian elliotis pine plywood prices topped US$295/m^3, a record high since this product has been tracked by ITTO's MIS. Brazilian suppliers of softwood plywood increased their deliveries to the US to become its major supplier (62% of US imports), well ahead of the former main source country, Canada. Brazil's softwood plywood exports benefited from duty-free status in the US under the Generalized System of Preferences system.

Figure 59. FOB prices for Brazilian elliotis pine plywood



However, prices for elliotis pine plywood declined sharply at the end of the year to US$185/m^3. This was due primarily to overstocking, after large volumes arrived at US ports following resolution of shipping problems in late 2004. Prices recovered in early 2005 as EU importers increased orders before the region's duty free quota for exports of softwood plywood (550,000 m^3 per year) was exhausted. But prices declined again as stocks started to rise.

Prices affected by import duties

Softwood plywood from Brazil lost its duty-free status in July 2005 and started to be subjected to 8% duty. In addition, Brazilian exporters started to pay a 7% duty on shipments to the EU as the annual quota was filled. This product was trading at US$215/m^3 in September 2005. Many plywood producers are said to be exporting in order to fulfill current contracts, while new contracts at the same prices are less likely as a result of an unfavourable exchange rate.

Final remarks

Chinese plywood will continue to substitute Southeast Asian and Latin American products as the quality of glue and filming in Chinese products improves. Most Chinese plywood exports are non-structural panels with hardwood faces. Tropical plywood, in turn, will retain niche market segments where high quality-uses are required. For example, while EU importers are increasingly switching to low-priced Chinese plywood such as 21-mm filmed plywood grades, the hardest-hit grade, Indonesian 4-mm filmed plywood is still holding market share due to quality problems in Chinese substitutes.

As Chinese products continue gaining market share, price differences are narrowing as quality improves. But Chinese products are not only price-competitive. Other reasons for substitution are steady supply and better transport/shipping logistics. Chinese plywood is also competitive due to the low cost but skilled labour force, incentives for foreign investment, low-interest loans from state banks, good logistics and aggressive marketing – despite a relatively low technology level.

Recent developments provide fresh good news for tropical exporters. Indonesian plywood (HS 4412.13.40) was granted a duty-free waiver by the US in July 2005. Panel prices are also strengthening in the US after Hurricane Katrina and the government is reportedly considering lifting some panel import tariffs for reconstruction. Pine plywood prices could pick up from October as initial deals for the 2006 EU duty-free quota are expected.

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Plywood futures*

Wang Lei
On behalf of Shanghai Futures Exchange (SHFE), Shanghai, China

Brief introduction to SHFE

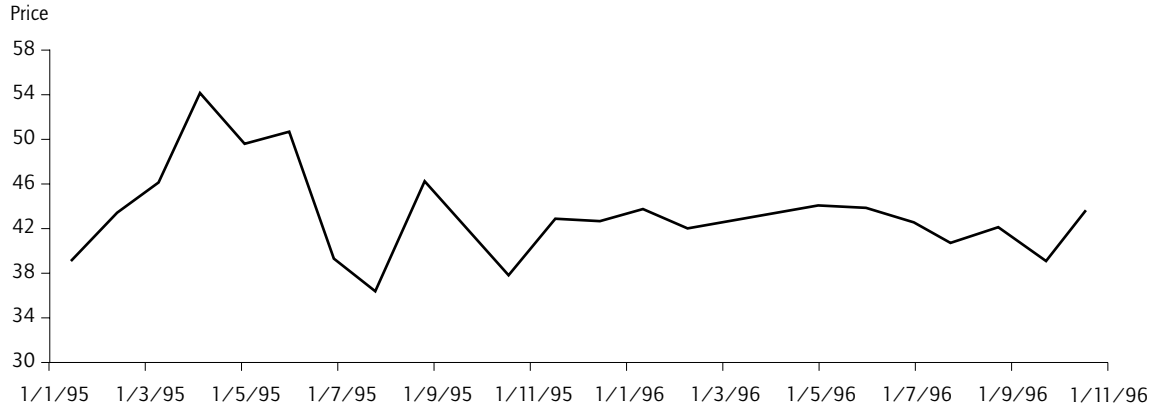
The Shanghai Futures Exchange (SHFE) was incorporated in 1999 on the basis of the former Shanghai Metal Exchange, Shanghai Goods Exchange and Shanghai Grain and Oil Exchange. The Shanghai Goods Exchange was incorporated in 1995 on the basis of the Shanghai Oil Exchange, Shanghai Building Materials Exchange, Shanghai Agriculture Materials Exchange and Shanghai Chemical Industry Exchange. At the beginning, plywood futures were listed on an honorary basis in the Shanghai Building Materials Exchange, which was established in November 1993. It was shifted to the incorporated Shanghai Goods Exchange in 1999 and became one of the five formally approved pilot run varieties at the end of the same year.

The SHFE is a juridical person. It fulfills the function stipulated in the rules of its corresponding laws, carries out self-discipline management in accordance with its statute, and is supervised and managed congruously by the China Securities Regulatory Commission (CSRC). At present, there are four varieties of standard contracts in the SHFE, including copper, aluminium, natural rubber and fuel oil. With the principle of legal system, supervisal, self-discipline and criterion, it concentrates on the strategic target "to build up a normative, high-effective, transparent comprehensive futures exchange with mainly economic derivative trading", and insists on scientific development, conception and innovation on the basis of stabilization, organizes trading strictly according to the rules of law and policies, fulfills the function of direct supervision in order to contribute as a secure and well-ordered market mechanism, creates an open, impartial, equitable, honest and transparent market environment so as to bring into play the functions of price investigation and risk avoidance, and offers a service for national economic development.

Table 25. Scale of plywood transactions, 1993–96

Year	Trade volume	Trade sum (100 million yuan)	Prompt volume (100 million yuan)	Prompt sum	Prompt trade (%)
1993	5.32	12.91	–	–	–
1994	2,721.52	2,518.18	–	–	–
1995	24,031.12	19,778.72	51.01	46.95	0.21
1996	6,131.79	5,353.43	18.75	15.29	0.31

Figure 60. Price trend of two consecutive agreement settlements at end of month (1995–1996)



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The trading situation of plywood futures

The scale of plywood trading

From November 1993 to 1994 in the Shanghai Building Materials Exchange, the trade volume of plywood (bilateral) hit 27 million hands and amounted to 253,109 billion yuan[6]. In 1995 and 1996, the trade volume of plywood (bilateral) hit 0.301 billion hands and amounted to 2,513.21 billion yuan in the Shanghai Goods Exchange. The average transaction rate was 0.26% in 1995–1996 (Table 25).

Standard agreement

Table 26. Plywood futures agreement of the former Shanghai Goods Exchange

Trade variety	Plywood
Trade unit	200 pieces per agreement
Minimum fluctuant price	0.1 yuan/price (20 yuan per agreement)
limitation on maximum fluctuation of price	no more than or no less than 3% of the settlement price of the latest trading day
Months of the agreement	Jan, Mar, May, Jul, Sep, Nov of every year (except the month in which the spring festival occurs according the lunar calendar)
Prompt time	Monday and Friday of every week
Prompt day	The 15th day of agreement (to be postponed when the day is an official national holiday or a weekend)
Promote data	25th–27th day of the agreement
Prompt grade	1. Take 2.7-3.2 mm (3-ply) x 1,220 mm x 2,440 mm (BB grade CC grade) plywood produced in Indonesia as the standard and the substitute and premium standard are carried out according to the stipulation made by the exchange.
	2. Quality standard should be in line with JPIC (1968)
Place of the business transaction	The storage appointed by Exchange to complete the business transaction
Cash security	Trading cash security is 5% of the sum of the storage holding agreement (account according to the settlement price of the same day)
Trading commission charge	Yuan per agreement

Substitute and premium standard: same-sized plywood produced in Malaysia can be used as a substitute, and the premium is 1.5 yuan per piece. The former Shanghai Goods Exchange adjusted the premium standard according to the situation of the spot market, and took the placard of the first prompt month as the standard.

Complete the business transaction of plywood

- The practical business transaction of plywood must be completed in the transaction storage appointed by the Shanghai Goods Exchange. At that time, there were six storages in total, all located in Shanghai
- The practical business transaction of plywood considered 2.7–3.2 mm thicknesses
- (3-ply) x 1,220 mm x 2,440 mm (BB grade CC grade) plywood made in Indonesia was used as the standard product, and plywood made in Malaysia could work as a substitute. The quality had to be in line with the JPIC (l968) and the original or copy of certificate of commercial certificate of origin, origin of the foreign trade contract or the copy of origin about the correlative goods had to be attached
- In the trade of plywood, the quantity of the same lot as well as the same country of origin had to be ten cases or integrals thereof (one case has 200 pieces)
- Plywood had to measure up to the stipulated standard of import and the out packages had to bear producing area, brand, trade name, import code and other marks. Every lot of practical transaction permitted no more than 10% breakage of the total volume, but damaged pieces had to avoid ambiguity in country, brand, trade name, import code and other signs; at the same time, the plywood inside had to be kept well
- In the process of checking and accepting the plywood, if the products were caught in the rain or otherwise obviously exposed to moisture, the appointed transaction storage had the right to unpack the boxes and conduct a spot test. If the inside plywood was damp or stained, the surface colour had changed, an interlayer peeled off or there were other problems, the plywood was deemed not up to the quality standard of trade, and the storage could refuse to accept it. Otherwise, if no quality problem was found, the appointed storages would not undertake the economic loss caused by the unpacking of the cases

[6] *Exchange rate (Sept 2005): 1 US dollar = 8.11 Chinese yuan*

- Notice: on 25 March 1998, the former Shanghai Goods Exchange released an article in which the producing area management of the trade of plywood was changed to brand management. The limitation of plywood transaction produced by state enterprises was withdrawn, and from then on, the goods for barter had to be the registered brands

The affect of the plywood trade on the market

After entering the market in China, the plywood futures trade had a large effect on Southeast Asian countries. The engaged plywood came from Indonesia and Malaysia; therefore, it advanced the plywood production of the Northeast Asia area. In order to complete business transactions, traders imported plywood and did business in futures exchanges and thereafter domestic market prices were formed. It should be said that plywood futures provided a way of hedging. Compared with others, domestic enterprises engaged most deeply in the activity, and the major reason was that speculators had enough funds and spot traders had the ability to analyse the market and inspect the merchandise at hand. At the same time, consumer enterprises also were involved to a degree; therefore, enterprises that made use of the futures plywood had one more way to purchase raw materials.

Prospect of plywood futures

Approved by the CSRC, plywood is one of the five pilot run varieties in the Shanghai Futures Exchange. Although the strategic target of the Shanghai Futures Exchange is "to build up a normative, high-effective, transparent comprehensive futures exchange with mainly economic derivative trading", our exchange also attaches importance to the study of relevant goods' markets, when we try our best to get financial futures products. In recent years, the economy of China has developed rapidly, urban construction is changing with each passing day and the interior decoration industry is advancing. Therefore, we are eager to strengthen the contact and communication with domestic and foreign markets and to jointly speed up the development of the plywood industry.

Standard and quality of plywood made in China*

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Standards of plywood made in China

At present, national and industrial standards of Chinese plywood mainly are:

GB/T9846—2004, 'Plywood'
LY/T1599—2002, 'Veneer'
GB/T18101-2000, 'Incombustible plywood'
GB/T 17656-1999, 'Plywood for concrete-form'
GB/T 5849-1999, 'Block board'
LY/T 1364-1999, 'Plywood for railway carriage'
LY/T 1417-2001, 'Birch plywood for aviation'
LY/T 1170-2004, 'Plywood for tea package'
GB/T 19536-2004, 'Plywood for container flooring'

Ply-bamboo standards include:

GB/T 13123-2003, 'Bamboo-bat plywood'
LY/T 1574-2000, 'Plywood for concrete-form'
LY/T 1575-2000, 'Strip ply-bamboo for bottom boards of trucks and buses'
JG/T 156-2004, 'Ply-bamboo form', etc

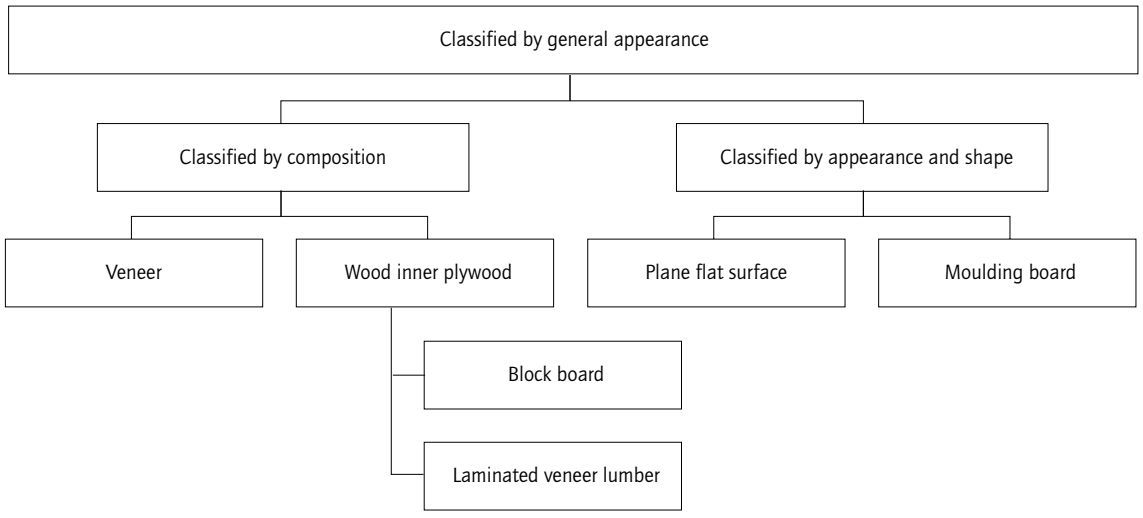
Furthermore, some standards are being formulated: 'Plywood for wood structure', 'Plywood for assembled package box', 'Moulding plywood', 'Bamboo-wood plywood', etc.

GB/T9846—2004 is the most popular and representative standard, and the other plywood standards are made for special products or functions. In this paper we narrow down the scope and focus on GB/T9846—2004 'Plywood'. It can be divided into eight parts.

First part: classification

This describes the classification of plywood mainly by general appearance, major features and final functions.

1) Classified by general appearance



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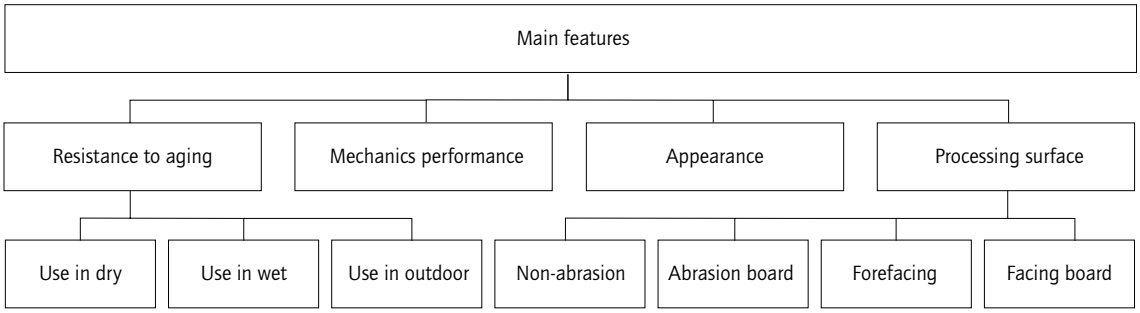
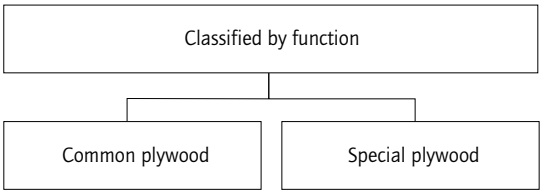
2) Classified by major features



3) Classified by function



Second part: dimension tolerance

This part stipulates the length of plane plywood (915 mm, 1,220 mm, 1,830 mm, 2,135 mm, 2,440 mm), the width (915 mm, 1,220 mm), the demission and tolerance of thickness and tolerance requirements of fringe vertical, vertical and warp (Table 27):

Third part

This part stipulates universal technical requirements for common plywood, such as structural requirements, feature of the face, and internal veneer. The standard stipulates that the thickness of face veneer of broad-leaf wood plywood cannot be more than 3.5 mm, and the thickness of inner veneer cannot be more than 5 mm; the thickness of inner and face veneer conifer plywood cannot be more than 6.5 mm. The thickness of all face veneer cannot be less than 0.55 mm.

Common plywood can be divided into three types: a) temperature-resistant plywood, used in the open; b) moisture-resistant plywood, used in moist places; c) non-moisture-resistant plywood, used in dry circumstances. Test conditions for adhesives vary

Table 27. Partial demission and tolerance requirements of plywood

Demission tolerance	Length and width tolerance	Thickness tolerance	Fringe vertical tolerance	Vertical tolerance	Warp tolerance
Requirements	±2.5 mm	There are two types: abrasion board and non-abrasion board and the tolerance varies according to its nominal thickness	1 mm/m	1 mm/m	t ≥6mm excellent product≤0.5% top product≤1% qualified product≤2%

Table 28. Thickness tolerance (unit: mm)

Nominal thickness (t)	Non-abrasion board		Abrasion board (one side)	
	Internal thickness tolerance per board	Allowable difference of thickness	Internal thickness tolerance per board	Allowable difference of thickness
2.7, 3	0.5	+0.4 -0.2	0.3	±0.2
3 < t < 5	0.7	+0.5 -0.3	0.5	±0.3
5 < t < 2	1.0	+(0.8+0.03t) -(0.4+0.03t)	0.6	+(0.2+0.03t -(0.4+0.03t)
12 < t < 25	1.5			

Note: if there are special requirements, negotiation should be made between the two parties.

according to the type of plywood. Test conditions for adhesives of different types are shown in the following table.

The physical strength performance of common plywood is shown in the following table.

The test method used drier 9~11 L for formaldehyde emission content of plywood, and the index is showed in the following table.

Fourth part: technical requirements for appearance of common plywood

This part prescribes the universal regulation and allowable defects (of the timber and process) used to classify the appearance grade of common plywood. The appearance grades are excellent, top-quality and qualified.

Fifth part: test regulation of common plywood

- Refers to the prescription in Part 4 to test appearance grade; adopt one sampling method and test level II, AQL 4.0
- Refers to the prescription in Part 2 to test specification and dimension; adopt one sampling method and test level S-4, AQL 6.5
- Refers to the prescription in Part 3 to test physical strength and formaldehyde emission content

Table 29. Treatment methods for adhesive in plywood of different uses

Type of board	Treatment condition	Note
I	Boiling the specimen in water for 4 hrs, drying it at (63±3°C for 20 hrs and boiling it again for 4 hrs, and then cooling down for 10 min, then subject to tension test	A fast test, in which the specimen is boiled for 3 hrs, is possible in mill, but the result must multiply modulus 0.9
II	Soaking the specimen in hot water at63±3°C for 3 hrs, then cooling down for 10 min and subject to extension test	A fast test, in which the specimen is dipped in hot water at 63±3°C for 1 hr, is possible in mill, but the result must multiply modulus 0.82
III	Conducting under drying experiment on qualified moisture-content specimen	Moisture content of specimen should be 8%~12%

Table 30. Physical strength performance requirements of common plywood

Index and type	Type of board or timber	I , II	III	Judge requirement	Note
Moisture content (%)	Broadleaf timber	6~14	6~16	Sampling and test again if it is not qualified	Arithmetic average of 3 specimens
	Conifer timber				
Bonding strength (MPa)	Basswood, cottonwood, lauan, paulownia, rubber plant wood, white phoenix wood, etc	≥0.70	≥0.70	1. the proportion of the number of specimens, whose bonding strength accord with the requirements efficient specimen ≥80%, eligibility 2. <60%, not qualified 3. <80% and ≥60%, to sample and test again, it is qualified if the result≥80%, or not	1. The value can be reduced by 0.20 MPa if the average wood failure ≥ 80% 2. The bonding strengths of other timber plywood refers to the requirements of the species in the table 3. To choose the lowest one when there are two species or more 4. Thick core structure needs
	Willow, elm wood, clone, lotus wood	≥0.80			
	Birch wood	≥1.00			
	Horsetail pine, larch, spruce, radiant pine, Yunnan pine	≥0.80			

Table 31. Proportion modulus of different thickness of adhesive strength

The proportion of the thickness of inner board to face board (t)	Modulus
1.50≤t<2.00	1.2
2.00≤t<2.50	1.4
≥2.50	1.6

Table 32. Stipulated requirements in the standard of formaldehyde emission content

Mark of grade	Limit(mg/L)	Judge requirements	Note
E_0	≤0.5	If the average of formaldehyde emission content in two lots of specimens accords with certain grade, this lot's boards accord with the same grade, or not	Can be used indoors directly
E_1	≤1.5		Can be used indoors directly
E_2	≤5.0		Can be used indoors after treatment of veneer

Table 33. The quantity of specimen of each board

Test item	Layers of plywood				
	3-ply	5-ply	7-ply	9-ply	11-ply
Moisture content	3				
Adhesive strength	12	12	18	24	36
Formaldehyde emission content	20				

Table 34. Import and export of plywood made in China in recent years

year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Import volume (10,000 m^3)	223	211	208	178	149	169	104	100.3	74.9	63.61	78.5	78.09
Export volume (10,000 m^3)	–	–	12.9	17.7	43.8	17.7	40	68.98	96.6	179.29	204	429.09

- Chooses the specimen at random from the lot supplied to be tested; if it accords with its requirements and grade through testing the appearance grade, specification and dimension, physical and chemical performance, to determine whether it is qualified and accord with this grade: or it is not

Sixth part: mark, label and packing

This part prescribes the mark, label, packing, transportation and store requirements of common plywood.

Seventh part: making the specimen with a saw

This part prescribes the physical strength performance and method and requirements for the process of making the specimen used in the test of formaldehyde emission content.

The dimension of the specimen is 400 mm × 400 mm, and should not have defects of timber or process. The number of each board which is to be made for specimens refers to Table 33. The specimens of the test on moisture content should be from three groups of samples. The specimens of formaldehyde emission content should be made in 6–7–7 piece.

If the thickness of the face board is greater than 1 mm, adopt model A; if it is ≤ 1 mm, model B should be adopted. It could be kept in three layers to test its adhesive strength and the other layers can throw off in multilayer plywood.

The specimen for formaldehyde emission content testing is 150 mm × 50 mm and the error of length and width ≤ 1.0mm.

Eighth part: the measurement of dimension

This part prescribes various ways for testing thickness, length and width of specimens.

Production and quality of plywood made in China

Quality situation from the change in import and export of plywood

The export volume of Chinese plywood is increasing year by year; meanwhile import volumes are decreasing. In 2001, the export volume of plywood surpassed imports, and export value surpassed import value for the first time in 2002. Table 34 shows that the quality of plywood made in China is improving year by year and is gradually receiving the endorsement of international markets.

From the above table we can say that, on one hand, import volumes in China are decreasing year by year and the situation is now stable. China is now self-sufficient in its domestic plywood needs. Quality control is more important for exports. The export volume of Chinese plywood increased in recent years, and the plywood quality of Chinese plywood received the approbation of other countries.

Quality of plywood made in China

After several decades of development and advance, plywood quality in China is developing step by step, and producers are competing strongly in international markets. Their products have received the approbation of other countries and the product standard is closing gradually to international standards. Since the enforcement of compulsive standard GB18580-2001: 'indoor decorating and refurbishing materials – limit of formaldehyde emission of wood-based panels and finishing products', producers have turned their attention to environmental protection; green and environmental protection plywood is becoming a hot issue with consumers. Generally speaking, large and medium-scale plywood companies in China use the adhesives of world famous brands and they also have the ability to explore low-toxicity and low environmentally harmful adhesive. With the increase in awareness about environmental protection, consumers have more and more power with their purchasing; manufacturers must improve their adhesives and techniques in order to satisfy green market needs.

Large and medium-scale plywood companies in China are able to keep a stable level of quality products, continuously introduce advanced equipment and improve techniques, and focus on innovation to increase the quality and variety of their products. With the help of advanced manufacturing and testing equipment, these large and medium-scale companies are able to produce international advanced products and can strictly carry out testing standards; moreover, they pay much attention to scientific management and use mature technologies and superior raw and subsidiary materials and therefore the final products are excellent.

The quality of products in small plywood companies is more variable. Such companies have a lot to do to compete in the high-end markets and most are likely to continue focusing on plywood for lower-quality uses, such as packaging and other short-term uses.

Conclusion

Plywood standards in China are being improved day by day and moving more and more into line with the standards required by major Western countries. So the target to meet international standards gradually can be expected soon. We must continue to improve and enrich the plywood standard system and to prescribe standards for plywood used indoors, outdoors and for structural purposes.

At present, China is a big plywood producer by quantity but, in general, not by quality and therefore the industry still has a long way to go. To speed up improvements in the width, depth and extent of applications, we need to improve the quality and grades of products and change the present situation in which the main Chinese products in international competition are boards used in wrapping cases, plates and architectural moulding boards and other low-grade products. By so doing the industry in China will change from profiting through quantity to profiting from variety and quality and will guarantee its healthy and sustainable development.

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Session III: Technological Developments in Tropical Plywood Manufacturing and Enhancing the Tropical Plywood Industry*

Technological progress in tropical plywood manufacturing

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Angelo Cremona S.p.A., Italy

Introduction

The company Angelo Cremona is a pioneer and leader in the international market in the manufacturing of lines for the production of decorative sliced veneer and plywood. The company was established in Italy in 1892; with its very long tradition it has provided a strong contribution to the development and modernization of the wood-panel industry.

This company has recently carried out some interesting projects in Africa for extremely modern production lines. These projects have allowed the transfer of the experience accumulated over the years working in direct contact with this company's customers. In fact, close cooperation between machine manufacturers and end-users is essential for obtaining substantial improvements in the productive process.

Premise

The growing difficulties of finding tropical logs of the necessary quantity and quality for plywood and the constant reduction of log diameter and quality have forced us to use production lines which have to perform each working phase in the most rational way. The solution that enables the wood-panel industry to develop is technological progress, which has to allow:

- the most efficient utilization of the valuable forest resources;
- a reduction in manufacturing time and processing costs; and
- competitive end-product quality level.

A modern plant is thus designed to maximize wood recovery using the minimum amount of labour while guaranteeing the highest qualitative plywood standard.

In the quest to modernize and increase the technological characteristics of tropical plywood production, two specific working phases have experienced greater technological development. These are also the most delicate phases of the working process where the above-mentioned goals have to be achieved.

The veneer peeling and drying process

A modern peeling and drying line for exotic logs must meet the above-mentioned goals and ensure high working flexibility. The previously-mentioned decrease in log diameters and log quality, and also the common practice of processing different hardwood species on the same line, must be considered by up-to-date plants.

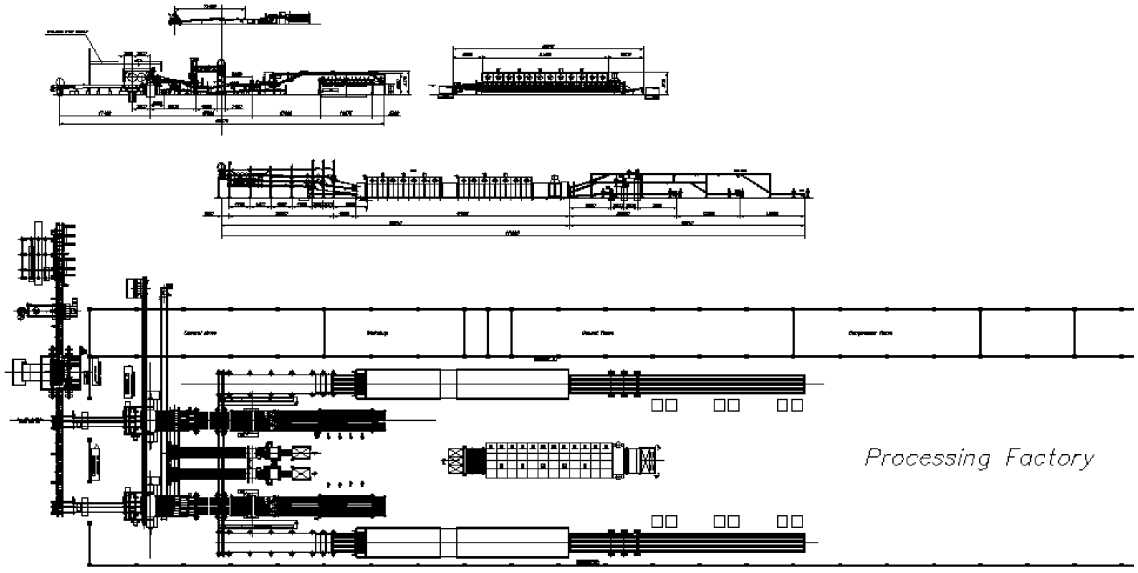
As widely known, large and medium-sized tropical logs have an external part which is of greater quality and is normally used for thin face and back veneer and an inner part of lower quality used for thick core veneer. Furthermore, when processing small-sized mixed tropical hardwoods it becomes necessary to use different working procedures depending on their quality.

This is what Angelo Cremona S.p.A. has carried out in the plants in Africa, where two different working systems for veneer peeling and drying have been applied to the same line to get the maximum possible production and flexibility (Figure 61).

The line is designed to peel thin veneer for face and back using, after the lathe, an automatic reeling system, and then to send the veneer to a continuous dryer with dry veneer clipping. The same line allows the processing of thick veneer of core quality in a direct way using a high-speed rotary clipper and an automatic vacuum stacker. The direct line also has the possibility of producing two short core veneer sheets with the ribbon veneer cut in half, each half being processed independently of the other.

** Text prepared by the editors based on a Powerpoint presentation given at the conference*

Figure 61. Dry veneer mill



The processing of logs into peeled veneer is performed in different working phases, summarized below.

- Log preparation
- Log centering and peeling
- Veneer round-up handling
- Reeling of good-quality peeled veneer, reel storing and unreeling
- Continuous drying of peeled veneer
- Clipping and stacking of dry peeled veneer
- Lower-quality peeled veneer wet clipping/ sorting and stacking
- Random and veneer sheets drying

Log preparation

Each factory had its own issues and problems with its log-yard and log selection that are essentially connected to wood species and mill lay-out.

The first operation is the sawing of the log into lengths suitable for the peeling line. The block is then debarked using a milling-head debarker, which is the most suitable machine for removing thick bark.

The blocks are ready and stored in front of the peeling line.

Block centering

This is one of the working phases to which particular attention has been paid in recent years and where positive results have been achieved.

The blocks to be peeled have to be centered accurately in order to be properly loaded on the peeling lathe and thereby to avoid the loss of good material. This phase is extremely important from an economic point of view.

Up to a few years ago, the systems most frequently used for tropical logs were the geometric system, in the case of small-diameter logs, and the optical centering system, in the case of medium- and large-diameter logs.

Neither system ensures good centering, although the optical system is better than the geometric one. In fact, neither allows the precise calculation of the block's bending and it ignores possible malformations in different areas. Besides, the optical centering device requires an operator and the centering accuracy is at his discretion.

Nowadays the trend is to use XY electronic log-centering and charging devices to improve not only raw-material utilization but also to increase the full sheet output, reduce the number of fishtails and strips, and get more high-quality face veneer (Figure 62).

Figure 62. XY electronic centering device

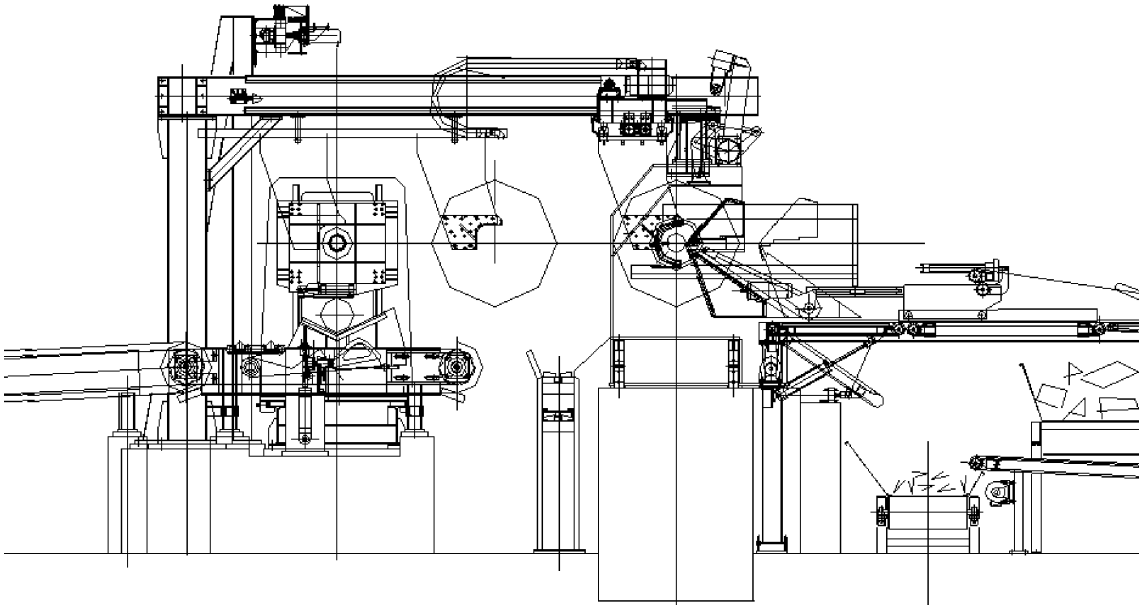
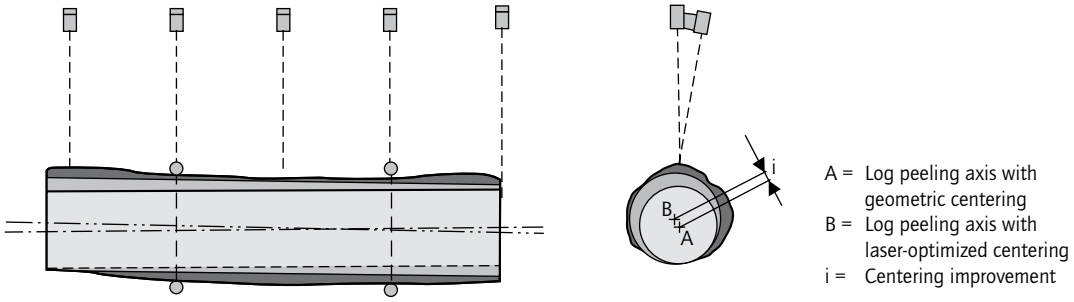
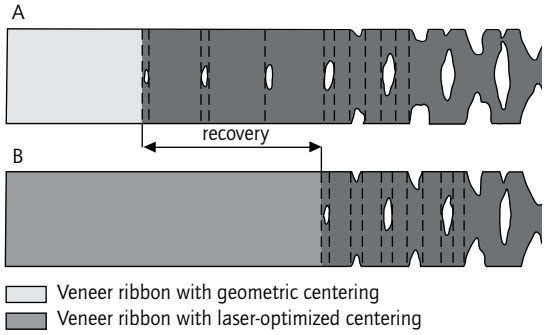


Figure 63a. XY centering improvement



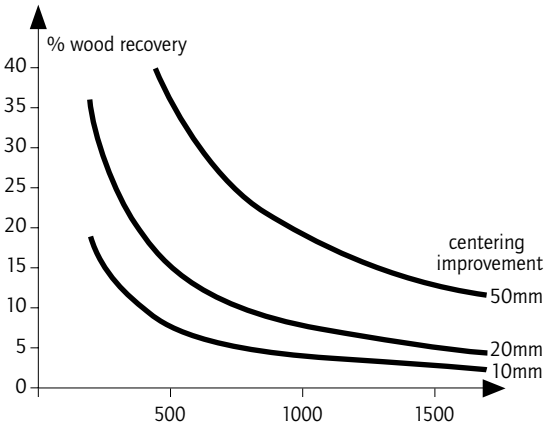
One of the most important current issues is to maximize log utilization in order to obtain the highest recovery. In this regard, some machinery manufacturers have paid attention to finishing with log cores at the end of the peeling process with the smallest possible diameter through the use of different devices mounted on the peeling lathe. But, most of the time, the peeling lathe is equipped with a geometric centering device that provides a rough centering result and therefore causes the loss of the most precious material, which is the external part of the log. In fact, to recover a small volume of core veneer, normally of poor quality, you loose a larger volume of the best-quality veneer out of the external part of the log than you can get when using an XY electronic centering system.

Figure 63b. XY centering veneer yield improvement



As an example, peeling a log core of 100 mm diameter down to 40 mm diameter, peeled at 2 mm thickness, you recover 3.3 m of core-quality veneer. On the other hand, if working with a block of 1,000 mm diameter using an XY electronic centering device, centering accuracy can be improved by 20 mm compared to standard centering, allowing the recovery of some 15.5 m of good-quality veneer if peeled at 2 mm thickness (see figures 63a–b).

Figure 64. XY centering improvement, wood recovery



For this reason, this company is suggesting the installation of XY electronic centering devices to ensure extraction of the maximum value of tropical logs, as has been common practice when processing small-diameter plantation logs.

Figure 64 shows how electronic centering increases the amount of recovery of good material compared to standard centering. For logs with an average diameter of 1,000 mm, an improvement of just 10 mm in centering precision translates into a 4% gain in wood recovery. An improvement of 20 mm translates into an 8% gain in wood recovery. For logs with an average diameter of 500 mm, the wood recovery increases by 8% and 15%, respectively. It is necessary to keep in mind that centering errors of 10–20 mm are made easily when using geometric and optical centering devices.

It is necessary to underline once again the fact that the recovered material is of the best quality and can be used for face veneer, which is nowadays harder and harder to get.

As a consequence of the greater quantity of full peeled veneer obtained with an XY charger, there is a dramatic reduction of veneer random, making the downstream process easier because of less veneer handling at the dryer and fewer veneer strips to be joined.

The working cycle of the XY electronic centering device starts with the block pre-centered geometrically and then put in rotation according to the geometric axis. The measuring devices are optical triangulation laser gauges, which allow the reading of each section during rotation, usually a point for each degree of the sections. The operation is performed very carefully (see Figure 65).

Figure 65. Laser gauges reading

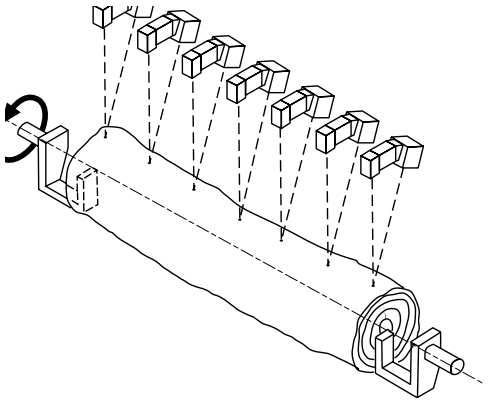
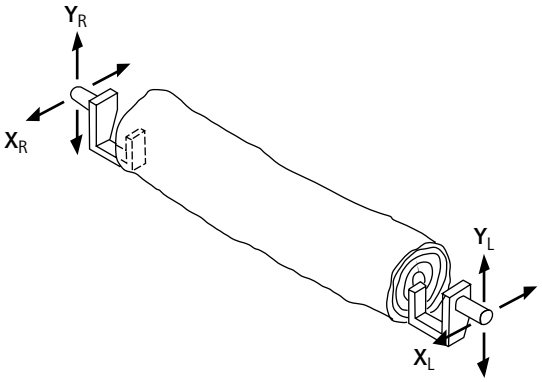


Figure 66. XY optimized centering



In this way the block is identified and measured at different sections according to length. The information coming from the lasers is sent to a computer, which processes the coordinates and, through an iterative calculation system, determines the new block axis. Consequently the X and Y positions are calculated and set on the log ends, right and left (see Figure 66).

The block therefore is in the correct position to be transferred onto the peeling lathe. The computer, besides making the necessary calculations for the centering operation, processes the data and saves the pertinent volumes and yields. It provides both single and cumulated values for production control.

Block peeling

If an XY electronic centering device is installed before the peeling lathe and if the lathe has electronic controls, it is possible to interface the two machines to speed up operations and improve performance. By coupling the XY centering device and the electronic peeling lathe it is possible to:

- pre-set the peeling lathe fully automatically to work the next block;
- withdraw the bar/knife-holder carriage group by a distance equal to the radius of the block to be loaded. This prevents complete withdrawal of the machine carriage during each cycle, therefore gaining time during both the opening and closing phases;
- program the peeling cycle so that it is fully automatic, considering that the peeling lathe knows the maximum outer block diameter – ie the diameter at which to begin the random peeling – but also the diameter that allows the production of a veneer ribbon to be sent to the reeling device or the direct clipping line.

Therefore the selection between waste, recoverable and usable veneer need no longer be left at the operator's discretion.

Devices have been updated on the peeling lathes to reduce idle time, improve veneer quality and reduce final log-core diameter. Some of these features are:

- instantaneous digital thickness change with incremental steps of 0.01 mm;
- automatic variation of the cutting angle based on a curve (not a straight line as before) freely chosen depending on the kind of log, with the possibility of making, storing and saving different curves to be recalled at any time;
- knife-holder carriage feeding system by means of ball-bearing screws of great precision and high loading capacity in order to ensure an extremely accurate peeling thickness and reduce wear;
- upper and lower double back-up roll. The upper one, with sets of idle rollers, is controlled by means of ball-bearing screws and moves on ball linear guides. The lower one with a set of rollers, which can be powered, is controlled in position by means of an hydraulic servo-cylinder;
- knife and nose-bar double cleaning system. Automatic and extremely efficient, with two channels: the first with air jet nozzles positioned over the nose bar and the second with an air jet positioned between the knife and the nose-bar in order to clean the cutting group in an extremely efficient way.

Furthermore, the two machines – XY electronic charger and lathe – are totally computer-controlled and have the possibility of being connected by modem to the manufacturer's factory in order to perform fast and timely technical assistance.

Veneer handling

As previously pointed out there are two veneer working systems after the peeling lathe. The morphological characteristics of exotic logs of medium and large diameter need to be considered in choosing the correct processing type for handling the veneer coming from the peeling lathe.

Due to the natural irregularity of the log, at the beginning of the peeling operation the random veneer produced is composed of irregular veneer pieces that must be transformed into recoverable strips by eliminating the defects.

Once the log has been rounded, the veneer produced is a continuous ribbon, coming from the external better-quality part, to be used for face/back full sheets. Continuing the peeling operation and reaching the log core, the wood quality worsens and the veneer produced is of lower quality. For this reason, the veneer is usually peeled more thickly and is usually used as the core layers of the plywood panels.

Taking this into consideration, the most flexible line is a combination of two veneer handling systems, a direct line and a reeling line – see Figure 67. The high-speed close-coupled direct line (similar to lines for small-diameter logs) is positioned in axis with the peeling lathe and supplies randoms and the inner

Figure 67. Mixed line for tropical logs

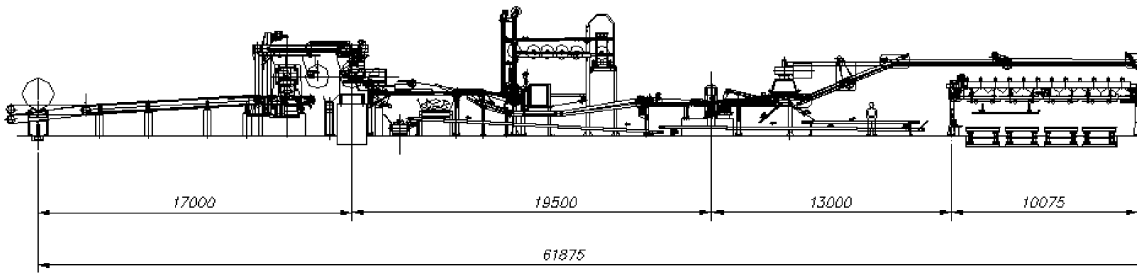
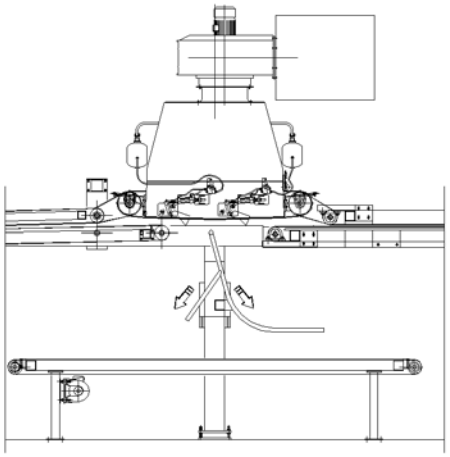


Figure 68. Automatic vacuum diverter



part of the log, peeled thickly, directly to the clipper. The rotary type clipper, with scanner and electronic control, cuts off veneer defects automatically and optimizes veneer clipping. The clipper speed is synchronized with the peeling speed and the veneer is therefore worked in real time.

A vacuum diverter with two tipples is placed at the outfeed – see Figure 68. The first tipple selects the waste veneer, which is sent to the waste-collecting conveyor after the peeling lathe. The second tipple discharges the recoverable veneer round-ups and sends them to the conveyor underneath, where they are collected and stacked by the operator. The full sheets continue towards the vacuum stacker, where they are stacked in one or more stations; the bin is selected based on qualitative or dimensional criteria.

Before the stacker, a special double – top and bottom – veneer turnover belt conveyor is foreseen to allow better stacking of those hardwood veneer sheets that tend to curl up (see Figure 69).

A further important technological innovation on the direct system has been carried out: this company has designed and patented a machine called the 'Twin Rotax', which has a twin-knife system that clips the veneer not only in the fibre length full width but also to allow the separate processing of the random or two half-sized parallel veneer ribbons using two independent scanners to optimize the working process and to ensure the best veneer recovery (see Figure 70).

The clipper and stacker therefore can process round-ups and ribbon veneer, both in full length (fibre length), or, using a lathe's spur knife in central position, they can process two side-by-side random or two parallel veneer ribbons to get two short core veneers at the same time.

A system for continuous reeling, storing the reels and drying the veneer is foreseen for peeled veneer of high quality out of the external part of the log. This is normally used to produce very thin face/back veneer.

The reeling machine is installed over the direct line and a pneumatic tipple performs the transfer of the peeled veneer from one line to the other. The reeling device is of a contact type to avoid breaking the fragile or thin veneer and is equipped with a fully automatic reeling system: a set of rollers covers the reel by adapting to its diameter, allowing the beginning of the reeling operation without manual intervention and without stopping the peeling process (see Figure 71).

Figure 69. Veneer turnover system and stacker

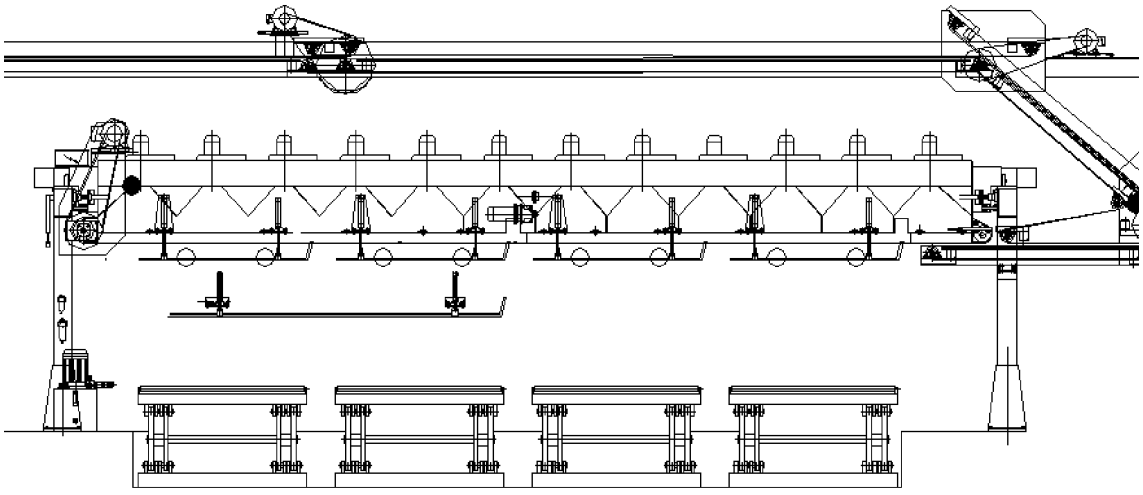
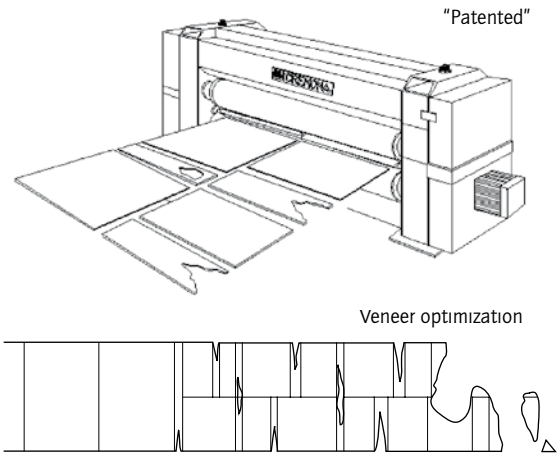


Figure 70. Twin Rotax ® Clipper Twin-Knife System



If log quality declines, it is possible to change the direction of the veneer towards the direct line at any moment.

When the reels are full they are lifted and stored over the reeling machine. The large main reel store is installed at the side. Thanks to a trolley it is possible to automatically carry a full reel and to come back with an empty one. The main store is composed of different decks that separate full veneer reels of different thicknesses or quality. At the end of the decks, unreeling devices feed the dryer decks automatically.

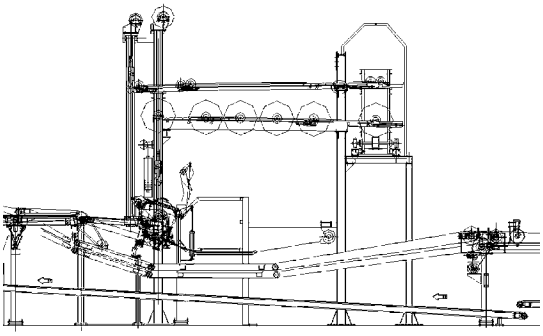
For each deck at the dryer's end, a dry veneer clipping system is foreseen with the automatic unloading of the cut-to-size sheets.

Veneer drying

Different types of dryers are used for tropical veneer drying: mesh type for thin veneer, roller type dryers for thicker veneer. Improvements have been made in the dryers to increase productivity and efficiency, optimize consumption and, above all, obtain good-quality veneer. To achieve this, special attention has been paid to improving the dryer's temperature and air-moisture controls. Dryer air humidity control is essential for obtaining high-quality veneer and to avoid veneer cracking and splitting.

Wood, like all organic materials, has a complex and heterogeneous structure. Different kinds of wood can show great variation. The formation of wood

Figure 71. Automatic reeling device



cells varies from one area to another, from one tree species to another and from one log to another. For all these reasons, drying wood artificially with the aim of increasing commercial value is a delicate operation. It has to be done so as not to alter the structure of the wood. Wood, or in this case peeled veneer, is a hygroscopic material with a natural tendency to exchange (absorb or transmit) moisture with the environment.

It is necessary to consider an essential point regarding the water inside the veneer. On one hand there is 'free water', which refers to water contained in the channels of the wood inside 'veins'. This type of water is easily eliminated from the wood without causing significant warping. On the other hand is intermolecular water – bound water – which is water inside the cells. This water starts to evaporate only when all the free water has disappeared. Compared to free water, evaporating bound water is more difficult and the process causes the wood to contract, which implies splitting.

This overview has been given for a better undertanding of the difficulties encountered in drying veneer wood correctly. These difficulties are compounded by the requirement to dry the veneer rapidly, with the least energy consumption, with the least warping possible and without any splitting.

How can we optimize the drying process and obtain high-quality veneer?

The solution is a well designed and properly manufactured dryer with good dryer temperature control and especially good climate control.

The dryer is divided in two or more zones. Each zone has its own equipment which is composed of:

– automatic temperature control system;

– automatic moisture control system; and a

– moisture recovery and transfer system.

Automatic temperature control system

The system has temperature reading probes positioned in the different zones of the dryer to transmit a signal to the regulators, which is proportional to the air temperature circulating inside the dryer. The regulators compare the real temperature values with the values set by the operator (set-point). The output signal is then transmitted to the regulating valves, which fine-tune the heat exchanger's temperature.

Automatic moisture control system

The system controls air moisture inside the dryer. The device performs a precise and continuous survey of the moisture contained in the air and adjusts the stack valves to keep the desired air humidity in the dryer. Through the automatic adjustment of the stacks, a considerable amount of thermal energy is saved and the moisture is kept constant inside the dryer, which helps in obtaining dry veneer of better quality. But this system alone is not enough to ensure the best drying process and the highest veneer quality; it has to be combined with the moisture recovery and transfer system.

Moisture recovery and transfer system

This is a very modern and up-to-date system that the company has designed to be used first of all on dryers for sliced decorative veneer, where quality is a must. Having obtained substantial improvements, the company has started to use the same system on dryers for peeled veneers.

As noted previously, it is relatively easy to remove the free water in the first zones of the dryer. This implies normally an excess of moisture in the air at the dryer in-feed that can be extracted outside through the stackers, but in this case losing thermal energy. On the contrary, at the dryer end it is always difficult to increase air moisture above a certain limit because the veneer has little water to release, being almost totally dry, and there is a risk of splitting and warping.

It is therefore necessary to increase the amount of moisture in the air in the final zones of the dryer to avoid these problems. It is very hard to do this in conventional dryers.

The new technology, named the moisture recovery device, allows the transfer of excess moisture in the first part of the dryer to the last part, where there is lack of humidity. By keeping moisture content high in this way it is possible to avoid splitting and to obtain good-quality flat veneer.

Besides the above-mentioned systems, a new computerized dryer control is currently being used. Depending on the wood species to be dried, the veneer thickness and the veneer moisture is measured at the dryer in-feed by a sensor, and the software program calculates the time needed to obtain proper veneer drying according to the desired final moisture.

The main functions automatically controlled by the computer are:

- the possibility of storing and subsequent retrieval of a great number of drying programs out of an appropriate database. The programs contain all setting data of the operational parameters of the machine, such as:
  - temperatures of the various zones into which the dryer is divided
  - contents of humidity of the air in the drying zones where the automatic moisture control is foreseen
  - contents of the final humidity foreseen in the veneer after the drying
- possibility of transferring the main production data taken during the operation process to a printer or the factory network.

Conclusions

Every single phase of the downstream process for the production of tropical plywood has been improved, but these improvements have been minor compared to the development of the peeling and drying operations that remain at the heart of the working process.

Automation is increasingly being used. In recent years, particular attention has been paid to the dry veneer grading system after drying, with automatic sorting and stacking lines of the veneer sheets using moisture veneer control and camera scanning systems.

There have been improvements in the splicing of veneer pieces to obtain good core veneer sheets. Upgrading has also been applied to the panel lay-up process, but these are often tailored to the specific needs of the end-user.

Reductions in idle time have been obtained through automatic loading and unloading systems, not only for the pressing lines but also on other working phases.

Other improvements have been performed on squaring lines in order to obtain accurate and very clean panel edges and also on sanding lines for panel calibration and finishing.

The market is increasingly competitive, with demands for ever-higher product quality, and the need to develop new technologies never stops.

Complying to changing tropical plywood standard and quality controls

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Introduction

In Japan, an amendment to the Building Standard Law was enforced in July 2003 and the regulation of building materials for sick-house syndrome began. Pertaining to that, JAS and JIS standards for wood-based materials were amended. In addition, small-sized chamber method JIS was standardized as a method for measuring aldehydes and volatile organic compounds (VOCs). It is very important to understand the standards and regulations relating to plywood in Japan, because a lot of tropical plywood is exported to Japan. Therefore, this paper introduces the countermeasures, regulations and standards regarding sick-house syndrome in Japan.

Countermeasures regarding sick-house issues in Japan

Table 35 list countermeasures against sick-house syndrome in Japan. The Building Standard Law and the standard of school environmental hygiene are regulations (compulsory systems), but the others are voluntary systems. Acetaldehyde was formerly included in the housing performance indication system but is now excluded because the World Health Organization informed the Japanese Forestry Agency that the acetaldehyde guideline of 50μg/m^3 was an error and the correct value was in fact 300 μg/m^3.

Guideline values for indoor air concentration:

- Guideline values for indoor air concentration for thirteen VOCs (not regulated) and interim guideline values for nominal and total VOC (not regulated)
- Building Standard Law: Prohibition of the use of chlorpyrifos, restriction of area for formaldehyde-emitting building materials, and obligation of ventilator (all are regulations)
- Housing performance indication system: Indication of formaldehyde emission grade and measurement of indoor air concentration (not regulated but voluntary system)

Table 35. Countermeasures against sick-house syndrome in Japan (μg/m^3)

Ministry	**Health, Labour & Welfare**	**Land, Infrastructure & Transport**		**Education, Culture, Sports, Science & Technology**
Measure or regulation	Guideline value for indoor air concentration	Building Standard Law	Housing performance indication system	Standard of school environmental hygiene
Formaldehyde	100	Restriction	°	100
Toluene	260		°(*1)	260
Xylene	870		° (*1)	870 (*2)
p-Dichlorobenzene	240			240 (*2)
Ethyl benzene	3,800		° (*1)	3,800 (*2)
Stylene	220		° (*1)	220 (*2)
Di-n-butyl phthalate		220		
Chlorpyrifos	1	Prohibition		
Tetradecane	330			
Di-(2-ethylhexyl) phthalate	120			
Diazinon	0.29			
Fenobucarb	33			
Acetaldehyde	48			
Nonanal (Interim)	41			
Total VOC (Interim)	400			

*° = essential, *1 = optional, *2 = optional*

Table 36. Categories of building materials subject to formaldehyde-emission controls

Category of building materials	Formaldehyde emission rate (mg/m^{2}h)	Mark of JAS, JIS and approval of the Minister of MLIT	Restrictions on interior finishing materials
No restriction	Up to 0.005	F★★★★	No restriction
Type 3 formaldehyde-emitting building	0.005 to 0.02	F★★★	Restriction on area
Type 2 formaldehyde-emitting building	0.02 to 0.12	F★★	Restriction on area
Type 1 formaldehyde-emitting building	Over 0.120	F★	Prohibited

**1 Measurement conditions: temperature: 28°C, relative humidity: 50%, formaldehyde density: 0.1 mg/m^3 (= guideline value announced by Ministry of Health, Labour and Welfare)*

**2 There are no restrictions on materials that have been used as parts of buildings for five years or more*

- Standard of school environmental hygiene: when constructing, remodelling and repairing, indoor air concentration should be less than reference level (regulation only for formaldehyde and toluene)

Regulation for sick-house issues of Building Standard Law

Chemical substances subjected to regulations

The chemical substances stipulated in the Law are chlorpyrifos and formaldehyde.

Regulations on building materials in relation to chlorpyrifos

The use of building materials containing chlorpyrifos in buildings is prohibited. (Building materials containing chlorpyrifos are exempted if they have been used as building parts for five years or more.)

Regulations concerning building materials and ventilation equipment in relation to formaldehyde

Restrictions on interior finishing materials

Categories of building materials: building materials now subject to formaldehyde-emission controls are classified under four categories according to their formaldehyde-emission rates (Table 36).

Prohibition on use of type 1 formaldehyde-emitting building materials: the use of Type 1 formaldehyde-emitting building materials as interior finishing materials in habitable rooms is prohibited.

- Habitable rooms also include other areas of buildings, such as corridors, which have permanent openings (such as door undercuts) and which are ventilated together with the habitable rooms according to ventilation planning
- Interior finishing materials are materials applied to the surfaces of walls, floors and ceilings (excluding picture rails, windowsills and similar parts). Pillars and other framing lumber, baseboards, handrails, head jambs, lintel joists, and other finishing trim, window/door trim and paints adhesives, etc, used in small quantities are excluded

Restrictions on use of Type 2 and Type 3 formaldehyde-emitting building materials: the use of Type 2 and Type 3 formaldehyde-emitting building materials as interior finishing materials in habitable rooms is limited to area sizes prescribed in Table 37.

Mandatory installation of ventilation equipment

Installation of at least one unit of ventilation equipment is mandatory.

Restrictions concerning ceiling cavities

Where mechanical ventilation equipment or centrally controlled air conditioning equipment has been installed, one of the following measures must be implemented to prevent formaldehyde from entering habitable rooms through ceiling cavities, etc (ceiling cavities, attics, cavities underneath floors, wall, storerooms and other similar locations):

(1) controlling the emissions of formaldehyde that might flow into habitable rooms by not using the following materials as base materials, thermal insulation materials or other similar surface materials, in ceiling cavities, etc:

Type 1 formaldehyde-emitting building materials

Type 2 formaldehyde-emitting building materials

(2) Controlling the flow of formaldehyde into habitable rooms through the use of airtight layers or seals

Table 37. Maximum multiple of floor area

Type of habitable room	Ventilation	F★★	F★★★
Habitable rooms in houses, etc (*1)	At least 0.7 times/hr (*2)	0.83	5.0
	Others (at least 0.5 times/hr but less than 0.7 times/hr)(*2)	0.35	2.0
Habitable rooms in buildings other than houses, etc	At least 0.7 times/hr (*2)	1.1	6.6
	At least 0.5 times/hr but less than 0.7 times/hr (*2)	0.71	4.0
	Others (at least 0.3 times/hr but less than 0.5 times/hr)(*2)	0.33	2.0

**1 Habitable rooms in houses, etc, are habitable rooms in houses, bedrooms in boarding houses, bedrooms in dormitories, and sales areas in stores engaged in commodity sales such as furniture and similar items*

**2 Ventilation includes ventilation achieved by using construction methods stipulated or approved by the Minister of Land, Infrastructure and Transport as providing a ventilation frequency equivalent or superior to mechanical ventilation equipment providing the ventilation frequency shown in the above table*

(3) For ceiling cavities, etc, where the countermeasures described in 1) or 2) have not been implemented, limiting formaldehyde flow into habitable rooms due to air pressure differentials by measures based on the use of mechanical ventilation equipment, etc, maintain the air pressure in habitable rooms at a higher level than in ceiling cavities, etc

Comparison of requirements of Building Standard Law and test conditions of ISO and JIS

Table 38 shows the requirements of the Building Standard Law and test conditions for the ISO and JIS chamber methods. The most important difference is ventilation/surface area (Q/S). The Q/S of the Building Standard Law is twenty times more severe than that of ISO. The Building Standard Law is the severest regulation for formaldehyde in the world.

Figure 72 shows an example of a 20 L small-chamber system according to JIS A 1901. Compared to the so-called JAS and JIS 'desiccator's test' for wood-based materials, it is difficult to conduct a lot of JIS small-chamber tests because of their long duration and high cost. Therefore, the small-chamber method is not suitable for the quality control test of low-cost products such as wood-based materials.

Figure 72. An example of the JIS 20 L small-chamber system

Table 38. Comparison of requirements of Building Standard Law and test conditions of ISO and JIS

Standard or regulation	ISO/CD 12460	JIS A 1901	Building Standard Law
Test method	1 m^3 chamber method	Small chamber method	(Any OK)
Temperature	23ºC	28°C	28°C
Relative humidity	50%	50%	50%
Ventilation/surface area (Q/S)	1.0	0.23 (Usually condition)	0.05 (at 0.1 mg/m^3 of concentration)
Time	Steady state	1–28 days	3–4 weeks
Criteria	None	None	0.005 mg/m^2hr (emission rate)
(Regulation or guideline value of formaldehyde concentration in air)	(0.06–0.1 mg/m^3 in European countries)	(0.1 mg/m^3 in Japan)	(0.1 mg/m^3 in Japan)

JAS and JIS standard for wood-based materials

Formaldehyde emission grade

Table 39 shows the formaldehyde emission grade for the JAS and JIS standards for wood-based materials. For both, formaldehyde emissions are measured by the desiccator's method.

Table 39. Criteria values (mg/L) for different marks of formaldehyde JAS and JIS emission grades for wood-based materials, and restrictions on interior finishing materials by Building Standard Law

Mark of JAS & JIS	Criteria values (mg/L)		Restrictions on interior finishing materials by Building Standard Law
	Average	Maximum	
F★★★★	0.3	0.4	No restriction
F★★★	0.5	0.7	Restriction of area
F★★	1.5	2.1	Restriction of area
F★	5.0	7.0	Prohibited

Correlation between formaldehyde emissions of JAS and air concentration

Formaldehyde concentrations are affected by ventilation, the surface area of wood-based materials, temperature, and relative humidity. The following equation is proposed for the prediction of formaldehyde concentrations in the air from JAS formaldehyde emissions (Inoue et al. 1990, Inoue 1997).

$$C = (0.158D+0.017) \times \{2/ (1+Q/S)\} \times 1.09(t-23) \times \{(55\ h)/100\} \quad (1)$$

C = formaldehyde concentration in air (ppm)

D = desiccator value (JAS formaldehyde emission) (mg/L)

Q = ventilation (m^3/hr)

S = surface area of wood-based materials (m^2)

t = temperature (°C)

h = relative humidity (%RH)

The Ministry of Land, Infrastructure and Transport (MLIT) has adopted the following equation, which is called Inoue's equation, with the experiment using full-scale residential housings.

$$C = (0.158D/6+0.017) \times \{2/ (1+Q/S)\} \times 1.09(t-23) \times \{(55\ h)/100\} \quad (2)$$

Inputting the requirements of Building Standard Law (Q/S = 0.05, t = 28 and h = 50) and JAS F★★★★ value (0.3) into Inoue's equation, C (formaldehyde concentration in air) becomes 0.077 ppm (0.093 mg/m^3). Then, the emission rate becomes 0.005 mg/m^2h because ES = CQ {E = emission rate (mg/m^2hr), S = surface area of wood-based materials (m^2), C = formaldehyde concentration in the air (mg/m^3) and Q = ventilation (m^3/h)}. Therefore, JAS F★★★★ satisfies the criteria of Building Standard Law.

Conclusions

In this paper, countermeasures for sick-house syndrome issues in Japan are introduced. The Ministry of Health, Labour and Welfare proposed guideline values for the indoor air concentration of VOCs. The MLIT amended the Building Standard Law and started the regulation of building materials. MLIT also started a housing performance indication system. In this system, indoor air concentrations of several VOCs are voluntarily measured when a new residential house is constructed. Pertaining to those, the Ministry of Agriculture, Forestry and Fisheries and the Ministry of Economy, Trade and Industry, respectively, amended the JAS and JIS (Japanese industrial standard) standards for wood-based materials. In addition, the Ministry of Education, Culture, Sports, Science and Technology started the regulation of indoor air concentrations in school buildings. The criteria of the Building Standard Law are expressed as emission rates. JAS measures formaldehyde emission by the desiccator method. JAS F★★★★ satisfies the criteria of Building Standard Law according to Inoue's equation.

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Structural changes in the tropical plywood industry and improving tropical plywood mill profitability

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Before getting to the technical aspects, let me first give you some general information about Ecuador, the country in which this case study is based. Ecuador is located in the northwestern part of South America right on parallel 0º (the Equator), bordering Colombia in the north and Peru in the south.

The Andes mountain chain runs from north to south, dividing the country into three different regions:

1) the western side faces the Pacific Ocean and has a tropical climate, with soil and weather completely different from the eastern side;
2) the centre, which has mountains as high as 6,300 m and valleys at an altitude of 2,500–3,000 m above sea level, with a very mild climate all year round; and
3) the eastern side, which runs towards the Amazon Basin and is very hot and humid.

This geographic composition gives the country a great variety of climates and soils. Past experience has shown us that the western side has very good potential for tropical plantations such as teak (*Tectona grandis*), laurel (*Cordia alliodora*), terminalia (*Terminalia ivorensis* and *T.superba*), jacaranda (*Jacaranda copaia*), eucalypts (*Eucalyptus grandis*), and many more.

Table 40. Ecuador general data

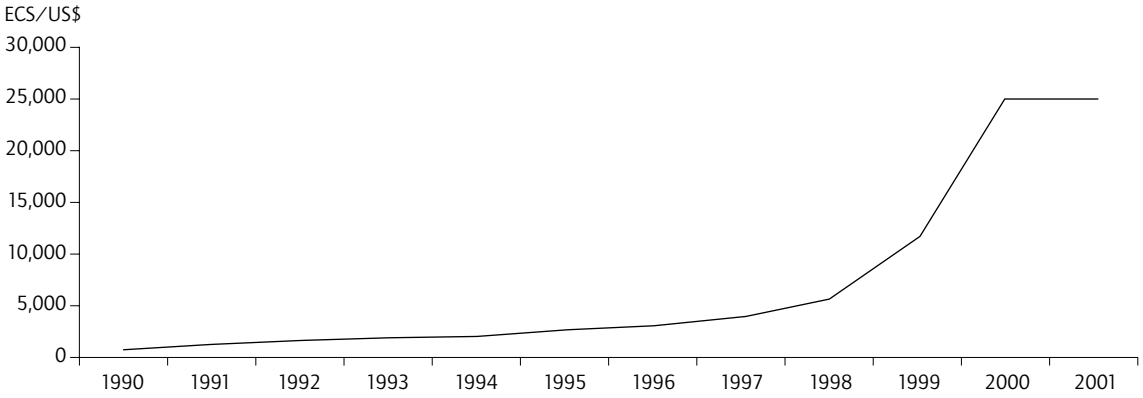
Area:	276,840 km^2
Population:	13.3 million (est)
Population growth rate:	1.24%
Gross domestic product (GDP):	US$32 billion
GDP per capita:	US$2,400 (est 2004)
GDP growth:	5.8% (est 2004)
Inflation rate:	1.94% (2004)
Public debt:	49.2% of GDP (est 2004)
Currency:	US$ since 2000
Unemployment rate:	11.1% (under-employment 47%)

Ecuador adopted the US dollar as its official currency in 2000 after many years of continued devaluation of the previous national currency, the sucre (ECS), due mainly to political instability. The sucre had devaluated from 822 per dollar in 1990 to 25,000 per dollar in 2000; a large part of the devaluation took place in the period 1998–2000 (Figure 73).

Company background

Endesa started operation in 1976 as a very simple plywood mill with a capacity of 12,000 m^3/yr and 50,000 m^2/yr of decorative veneers. The vast experience

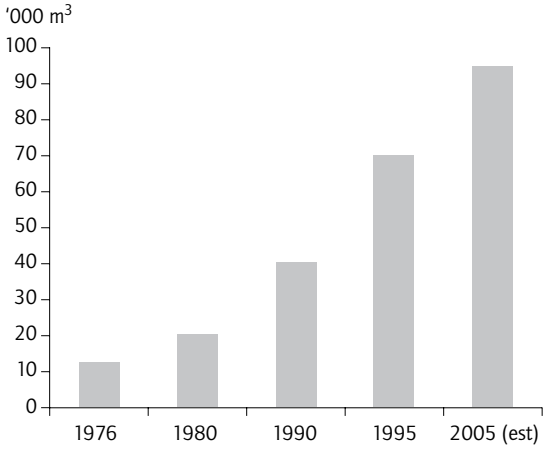
Figure 73. Sucre (ECS) vs US dollar exchange rate



of the Durini family in the wood business was assembled at Endesa to form a great team that has been managing the mill for 30 years with few changes. The continued growth of Endesa to meet growing market demand was also the reason for establishing a second mill called Botrosa, which is located very near the plantation area to take advantage of low transport costs.

Even though the company has faced problems such as closed markets, currency instability, high interest rates, and the Asian crisis of 1998, when plywood prices plummeted, mill production has grown continuously (Figure 74). The company has weathered all these problems and learned many lessons from them.

Figure 74. Endesa plywood production

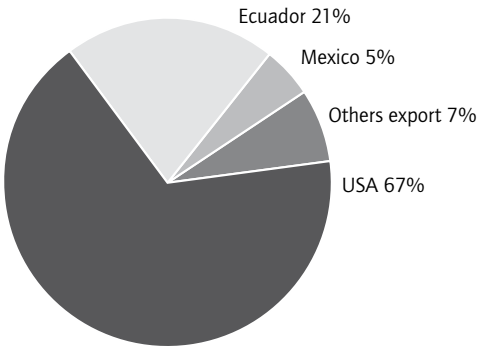


The main goals achieved by the mills up to 2005 were:

- product compliance with IWPA standards;
- certifications:
  - ISO 9001:2000
  - Business Anti Smuggling Coalition;
- over 1,000 direct employees and more then 2,500 indirect jobs;
- since 1978 the mills have run a forest program called 'Bosques para Siempre', or 'Forest Forever', which includes the following:
  - 9,370 hectares of land, of which 7,030 hectares are already planted with several species, mainly laurel (*Cordia alliodora*), *Terminalia ivorensis*, *T.superba* and jacaranda (*Jacaranda copaia*)
  - 30,000 hectares of productive natural tropical rainforest under SFM; and
- through Fundación Forestal JMD, a private NGO dedicated to silviculture, the mills carry out a research and genetic improvement program for several tree species, which have been internationally recognized, and FCS certification is in progress.

Figure 75 shows current sales distribution by country. This has changed significantly in the last 30 years. Venezuela and Colombia were the main markets at the beginning. Annual sales now exceed US$33 million.

Figure 75. Endesa sales distribution by country



Mill structural changes

Figure 76 shows the percentage of plantation and natural-forest timber in the raw-material supply for 1995–2005, with the percentage of plantation wood increasing over the period. It is envisaged that the current composition of plantation vs natural-forest timber will be reversed over the next 10–15 years, meaning that up to 75% of logs will come from plantations and 25% from sustainably managed natural forests.

The average diameter of logs dropped from 54 cm in 1994 to 47 cm in 2005, but, interestingly, wood recovery increased from 48% to 60% over the same period (Figure 77). This increase is composed of two parts. The first is an increase from 48% to 57% as a result of large investments made in state-of-the-art machinery during 1994 and 1995. The second is an additional 3% increment, to reach 60%, achieved through a permanent labour training program. Since 1995 the mill has been unable to make additional investments in new technology (machinery) because of unstable markets, a lack of financing in Ecuador, and high interest rates.

Figure 76. Endesa wood consumption, 1995–2005

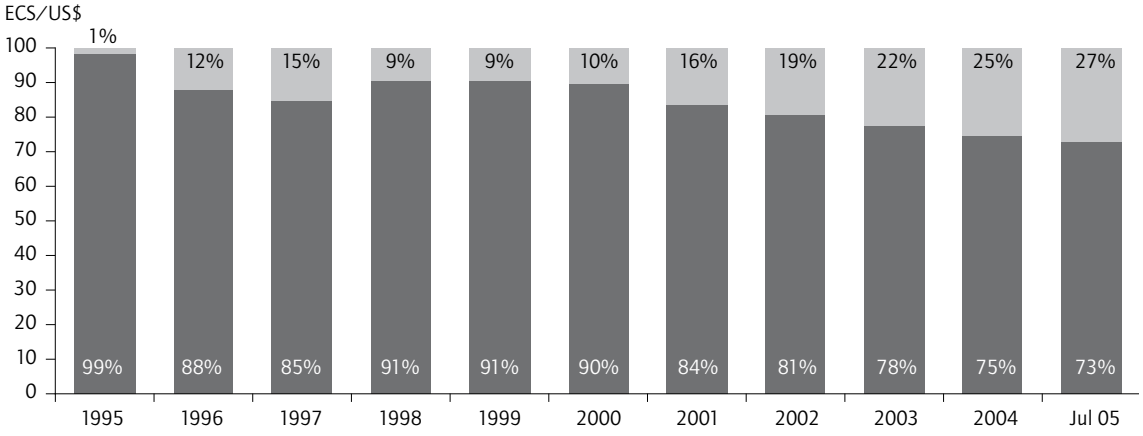
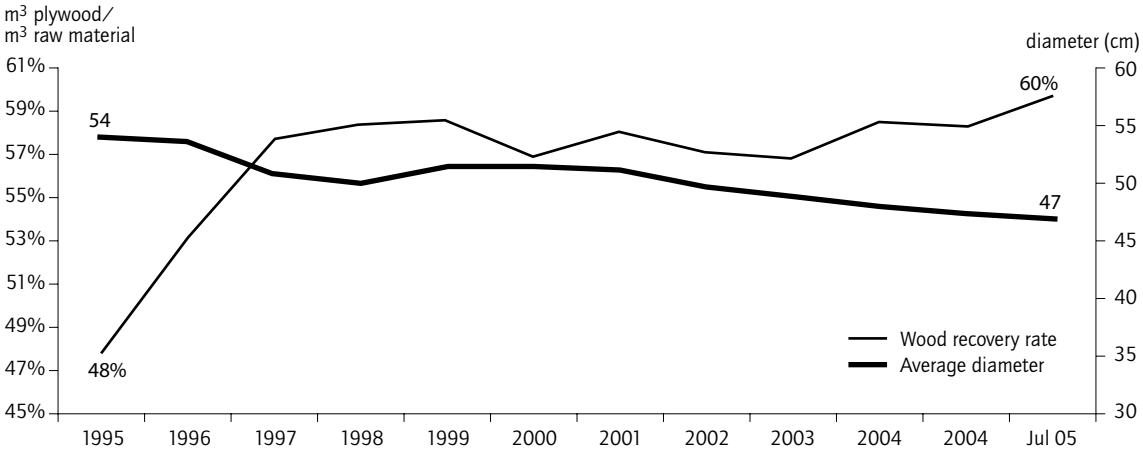


Figure 77. Endesa raw material wood recovery rate



The present raw material being used by the mills is coming from both natural forest and plantations.

Original machinery

Figure 78 shows the machinery used when the mill started in 1976.

Figure 78. Endesa plywood mill original machinery

Since most of the machinery is imported, the weight of fixed assets is a lot more critical than in Japan, Europe or the US; therefore we must utilize old machinery as efficiently as possible. The Endesa team of engineers has been successful in modernizing these 30-year-old machines by changing electrical systems to electronic systems, improving material flows, and, where possible, automation.

Current machinery

Figures 79a–e clearly show how the mill transformed from something very simple in the 1970s to something more sophisticated in the 1990s.

In the management of raw materials it is very important to keep logs fresh and free of blue stain. Special efforts have been made to store best-quality logs in water ponds, and also to sort by wood species to avoid veneer mixtures that damage product quality.

Reeling systems take care of the best logs to produce face and back veneers. Two more peeling lines, one direct line for 8-ft veneers and one 4-ft veneer line

of special execution, take care of second- and third-grade logs to complete the veneer demand of the mills. Production is based on four well-known species and 18 lesser-known species.

These figures also show flexible systems in the peeling lines used in order to maximize recovery.

Figure 79a–e. Endesa plywood mill current machinery

a

b

c

Six veneer dryers of different brands are in operation, three shifts per day, six days per week. Some are equipped with moisture meters at the dry end to avoid over-drying. A series of five core composers per mill are used to maximize recovery and quality.

d

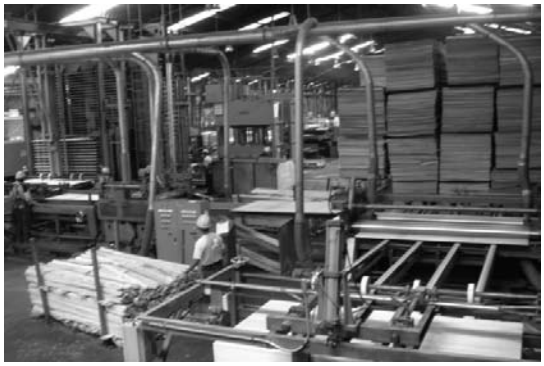
The gluing and pressing lines have the following characteristics:

- four 8-ft glue spreaders;
- three 30-opening automatic presses used for regular plywood production; and
- two 15-opening manual-loaded presses (original machinery still in operation) used for special products.

e

Two automatic trimming lines, one per mill, square each board to perfection (see Figure 80).

Figure 80. Endesa automatic trimming lines



At the end of the production process (Figure 81), there are three sanding lines with two heads at the bottom and three heads in the top; these produce a final product with a very smooth surface.

Figure 81. End of the Endesa production process

We have learned that packaging is a key issue in the perception of product quality. It should protect the product and at the same time promote the brand name. Furthermore, it must comply with the new FAO packaging regulations of heat treatment or fumigation.

Profitability

To properly address the issue of profitability, we must consider the three main cost components of the product, all of which have to be continuously watched and monitored. In order of importance they are raw-material cost, labour cost, and resin cost. Each is analyzed before and after dollarization in Ecuador.

Figure 82 shows that the cost per m^3 of wood fell dramatically – to US$85/$m^3$ – when the local currency reached its highest level (25,000 sucres per dollar) in 2000. The price has recovered and stabilized since and in the last three years has been at a level of around US$120/m.

Figure 82. Endesa profitability: wood cost

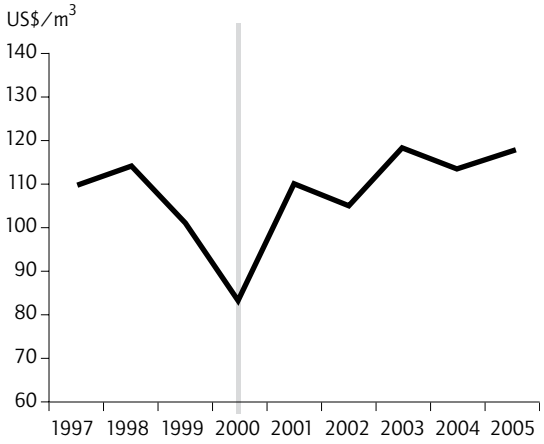


Figure 83. Endesa profitability: wages (monthly legal salary)

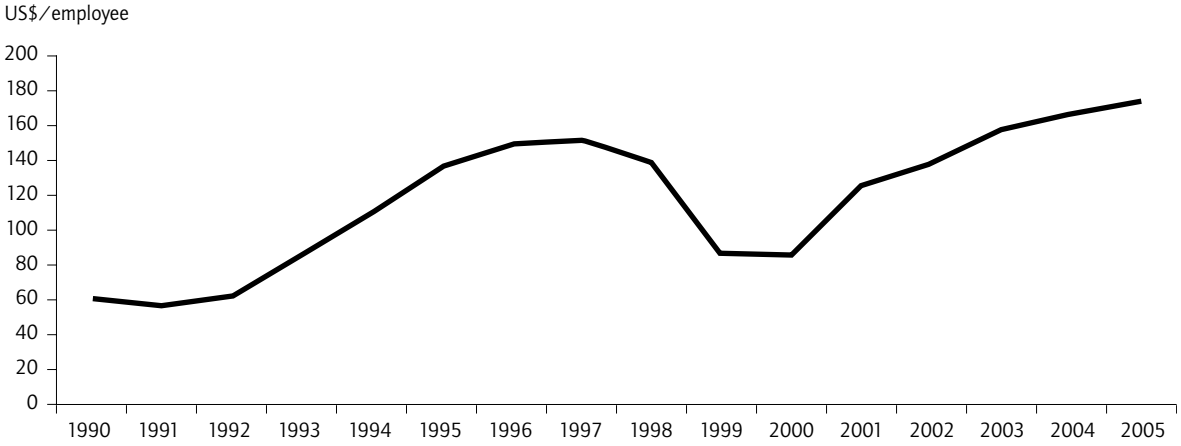
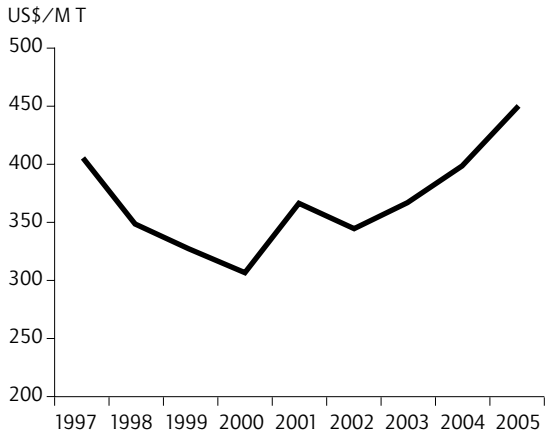


Figure 83 shows that monthly wages reached US$150 in 1997, dropped to US$82 in 2000, and recovered very fast to reach a present level of US$180. This level of wages does not take into account social benefits, which amount to 100% of the legal salary.

Figure 84. Endesa profitability: urea-formaldehyde glue resin cost



Given that methanol and urea, two components of the resin, are by-products of oil, current oil prices have raised the price of resin significantly. However, prices have increased even more in the last year because of a shortage of methanol in our part of the world. As seen in the last three charts, mega devaluations, which unfortunately are typical of under-developed countries, where most of the tropical hardwood plywood is produced, cause a temporary lowering of costs. Afterwards, inflation catches up and in most cases costs end up being higher in real terms than before the devaluation occurred.

These lower costs do not always represent bigger earnings for the producers due to the bargaining power of the large trading companies, which pay less as producer costs decline but are slow to pay more when producer costs start to rise again. This was the case in the 1998 Asian crisis when plywood prices plummeted to 50% of the original levels and, seven years later, still have not fully recovered.

After Ecuador adopted the US dollar as its currency, the mills focused their attention on reducing costs. Technological investments and especially constant employee-training programs have offset the increase in costs through higher efficiency; Table 41 shows the breakdown of averages costs for Endesa/Botrosa and for several countries.

Figure 85 uses RWS Engineering Oy (2004) information to compare production costs for Endesa/Botrosa against those of our main competitors, Brazil and Indonesia. Of the three, Brazil has the lowest cost (US$230/$m^3$), followed by Endesa-Botrosa (US$250/$m^3$) and Indonesia (US$260 per/m^3).

Table 41. Estimated average production costs of hardwood plywood by country (US$)

Production	Brazil	China	Indonesia	Russia	Endesa/ Botrosa	Latvia	Finland	South Europe	East Europe	US
Raw material mill price	45	80	80	42	70	60	72	85	95	130
Wood recovery rate	41%	50%	50%	30%	59%	32%	33%	41%	32%	40%
Waste compensation	0	0	0	0	0	20	60	0	0	45
Wood cost, net	110	160	160	140	118	165	155	205	295	280
Wages	25	15	20	35	60	50	120	85	40	180
Glue	30	25	25	30	24	35	40	25	35	20
Energy	20	15	15	15	14	30	40	35	20	15
Maintenance	20	10	20	20	17	30	35	40	25	20
Total variable cost	205	225	240	240	233	310	390	390	415	515
Fixed costs	25	15	20	30	17	35	45	45	35	35
Total operational cost (US$/$m^3$)	230	240	260	270	250	345	435	435	450	550

Figure 85. Endesa profitability: production cost

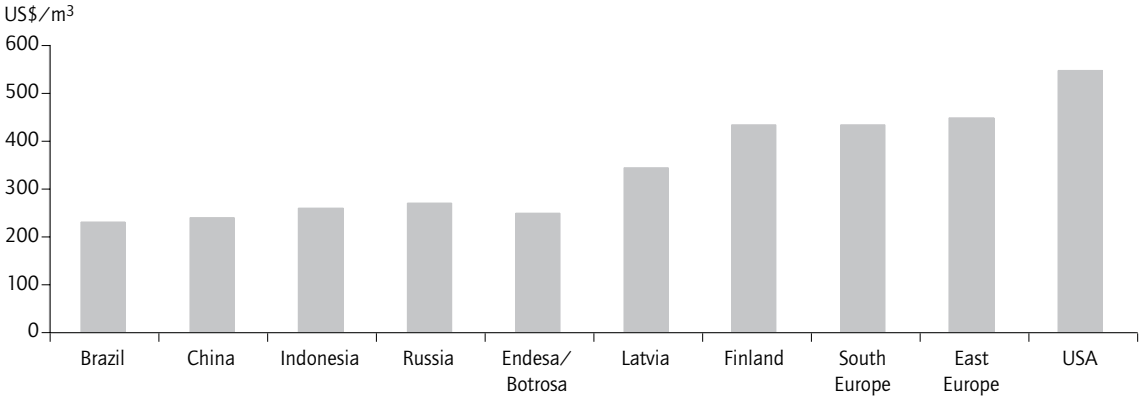


Figure 86. Endesa annual plywood production and operating margin

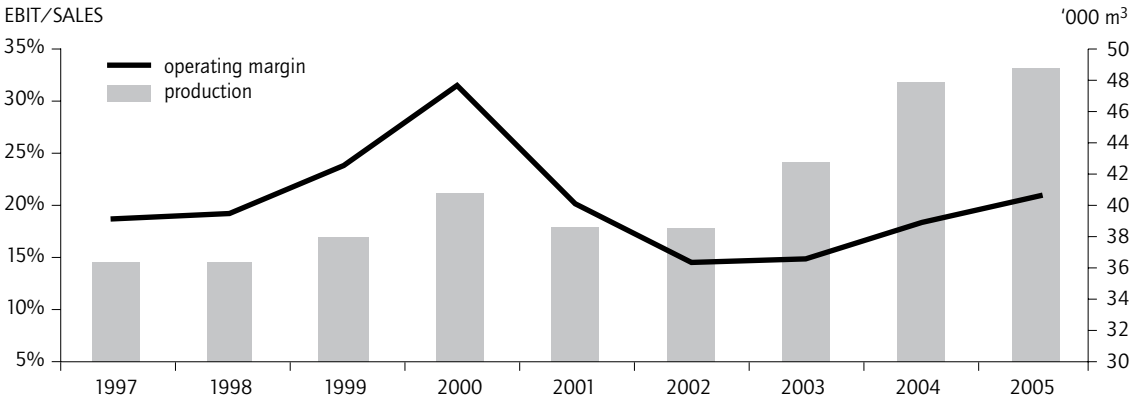
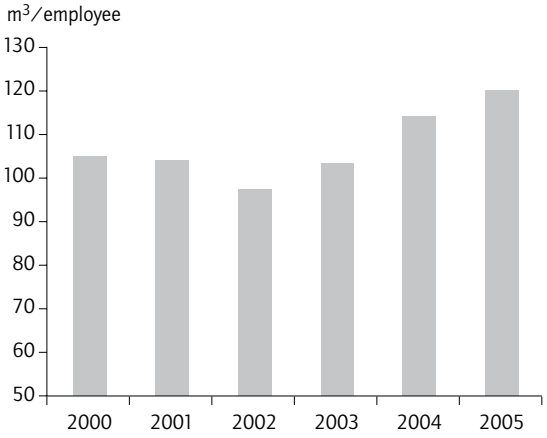


Figure 86 shows that production increased to 42,000 m^3 in 2000 (the year of dollarization), then dropped slightly over the next couple of years due to a September 11 effect (the US is our main market). Starting in 2003 the market recovered and so did production, mainly influenced by labour productivity.

The operating margin reached its highest level in 2000 due to the very high devaluation and a slight recovery of prices from the 1998 Asian crisis. After 2000, the operational margin narrowed due to an increase in costs caused by inflation in real US dollar terms and a decrease in demand because of September 11. Thereafter, all efforts were directed towards reducing costs and the operating margin improved after 2003 driven by higher production, an increase in productivity, and a slight price improvement in the local and international market.

Figure 87 shows that in developed countries labour is the second-most important cost component. After Ecuador adopted the dollar as its official currency, we needed to focus our attention on labour costs and labour productivity in order to diminish the impact of this factor. Figure 87 illustrates the recent improvements in labour productivity that have been obtained.

Figure 87. Endesa labour productivity



Following are the steps taken in order to increase labour productivity and improve product quality:

Profitability: labour strategy

- In-house school to bring every worker to high-school level
- Permanent technical training: 1,162 hrs/yr (2004)
- Salary: 50% over the minimum legal salary, according to production goals
- 'Open door policy' between management and employees
- Medical services for employees and their families
- Savings and loan worker's association
- Rewards for best improvement ideas
- Other benefits: annual trip, Christmas celebrations for employees and their families, working uniform, daily meals, transportation, summer camps for workers' children, field trips around the world for selected personnel

The company defined this labour strategy as part of our commitment to the community, our employees and our shareholders. To further complement our commitment we are in the process of obtaining FSC certification for our forest plantations and natural forests.

The labour strategy brings the following benefits:

- Excellent working attitude and environment
- Personal improvement
- Self-esteem enrichment
- Conformity with company goals
- Labour stability
- Absence of labour problems
- Good working environment

To finalize the presentation it is necessary to indicate that this company has also given a lot of attention to the development of new value-added products in order to maximize profitability, as described below.

Profitability: value-added products

Value-added products represent about 20% of total volume sales, in products such as:

- ultra light plywood (350 kg/m^3);
- decorative plywood;
- phenolic film-overlaid plywood;
- high-pressure laminated overlaid plywood; and
- balsa-ply TM (super ultra light block board 250 kg/m^3).

In addition, the company and its balsa-ply panel product have received international recognition at the Interzum Fair in Germany.

I would like to conclude with the following statement from our management:

"The manufacturing of special value-added products for high-quality markets has improved the overall working practices of the company and has also optimized the available resources to offer the best-quality products required by our customers."

Profitability = Sustainability

The competitiveness of tropical plywood in the global markets

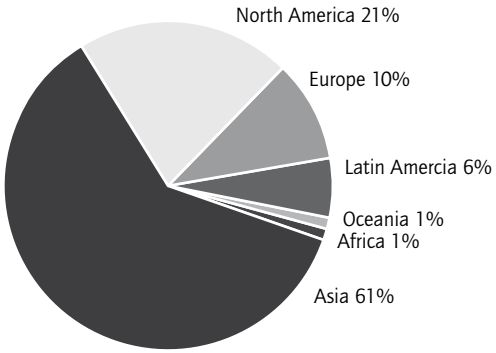
Paolo Gardino
Genova, Italy

Introduction

Plywood consumption in the world keeps growing. Wood-panel consumption has been very dynamic. On the contrary, tropical plywood production decreased between 1991 and 2001. Therefore, tropical plywood does not seem competitive in the global market. However, this general assumption hides the fact that in many cases tropical plywood is competitive, and consumption in certain market segments or in certain countries is growing. In general, tropical plywood is less competitive when it is sold as a commodity in sectors like simple construction, packaging and cheap joinery. It is more competitive when it is sold as a special product for special construction uses, high-quality joinery and furniture. Future developments must keep in mind that tropical logs will become scarcer; therefore it is useless to pursue a policy of large volumes and cheap price and better to identify growing niches of higher value-added. Tropical plywood producers must take advantage of the superiority of tropical plywood against most other products in terms of clear faces and, in some cases, of technical performance. Producers must also enhance the flexibility and quality of their production. Strong associations must be created. Associations will help with marketing information and in lobbying when non-tariff barriers are created. Companies must invest more in research and marketing. Plantations of species suitable for producing plywood must be improved in tropical countries.

According to FAO, world plywood production was in the range of 64 million m^3 in 2003. This is a large quantity, but it is only a fraction of total wood-panel production, which in the same year was about 215 million m^3. Plywood production is not spread evenly across the continents. As shown in Figure 88, Asian production amounts to 61% of total and North American production to 21%. All other continents combined account for only 18%. One can therefore say that plywood production is "an Asian business".

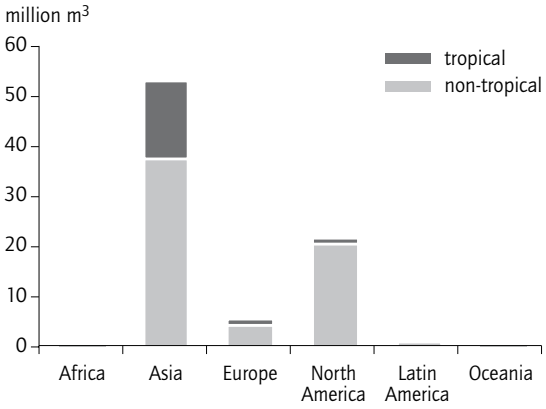
Figure 88. Percentage of global plywood production by volume, 2003



Source: FAO

Tropical plywood is only a relatively small proportion of plywood production (Figure 89).

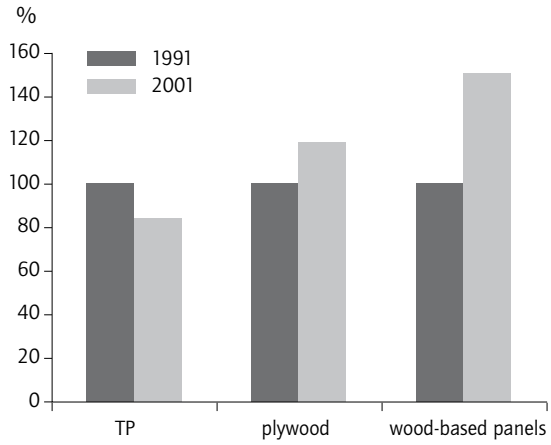
Figure 89. Tropical plywood consumption vs non-tropical plywood, 2003



Source: ITTO

If we have written that plywood production is "an Asian business", this is much truer for tropical plywood. Therefore this paper, analyzing tropical plywood competitiveness in a global market, must mainly take into consideration the situation in Asia, although tropical plywood is also produced and consumed in all other continents. Wood-based panel production grew considerably between 1991 and 2001, as shown in Figure 90, even though tropical plywood production decreased in that time.

Figure 90. Percentage change of wood-based panel production and tropical plywood, 1991–2001



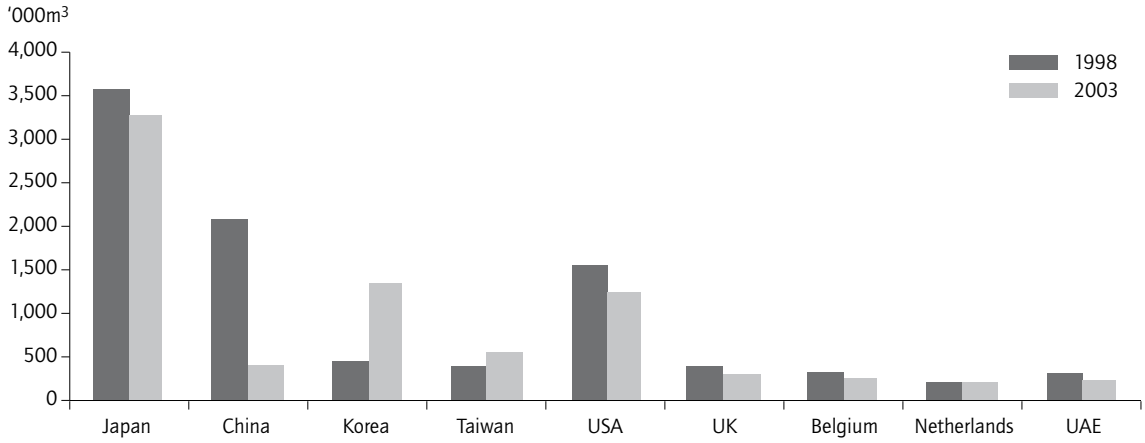
It is clear that if production of all products grows, while tropical plywood production drops, there is a problem. In addition, tropical plywood imports are decreasing in some of the main importing countries, as shown in the Figure 91.

Over the period, imports by all countries except Korea and Taiwan Province of China decreased, some considerably. The reasons for this drop are probably different for different countries. However, the bottom line is that, over the period, tropical plywood consumption declined while consumption of all wood-based panels grew.

Figure 92 shows that US imports of plywood from some countries increased between 1998 and 2002 but declined in others. Therefore, the problem is not a crisis of all plywood but of tropical plywood.

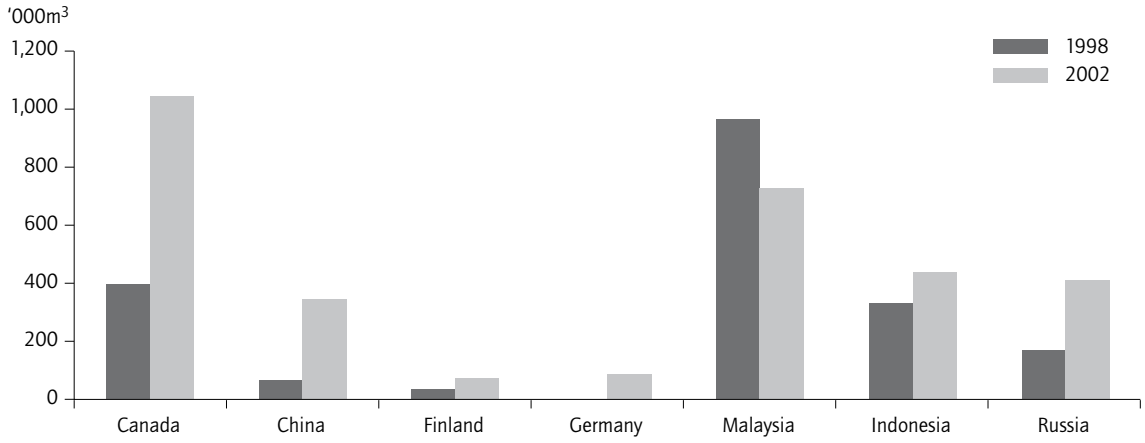
If one can identify the reasons for growth of or decline in imports in certain countries, perhaps we will find an answer concerning the competitiveness of tropical plywood.

Figure 91. Tropical plywood imports in some major countries, 1998–2003



Source: ITTO

Figure 92. Plywood imports to the US from some major countries, 1998–2003



Source: FAO

Figure 93. Market segments using tropical plywood in the world

Source: Gardino

According to our information, which is based on experience and not on a 'scientific' approach, tropical plywood imports to the US from Indonesia have been hit by cheap prices in some competing items, such as OSB. Moreover, uncertainties about contracts, shipments, etc, as well as a crisis in production, have created a barrier, especially strong in 2003, to imports from this country. On the other hand, imports from other countries have grown because of attractive prices (China), a high profile and technical characteristics (birch plywood from Finland and Russia), and high quality (Germany).

Analysis of the competitiveness of tropical plywood

According to the analysis made in the first part of this paper, one can say that, overall, tropical plywood is NOT competitive in the global market.

However this generalization can be misleading. Tropical plywood includes many different products, produced in different countries, made with different species and used in different continents by many market segments. In order to understand the real competitiveness of tropical plywood one needs to analyze all the main products and market segments. This is impossible in the space of this short paper; therefore, we limit ourselves to a few simple distinctions.

In Figure 93, we report our evaluation of the world's main market segments using tropical plywood. The evaluation is very general and the situation varies considerably from country to country.

- The main market use is traditional construction and packaging. These sectors, especially in Asia, use cheap commodity-type plywood
- Furniture and joinery are a broad and diversified sector. This sector can use highly specialized tropical plywood panels or simple and cheap items in different countries and for different final uses
- Film-faced tropical plywood represent a growing sector, generally with higher value-added than traditional construction plywood
- 'Other high-quality' uses cover a range of uses, usually requiring special panels

According to our evaluation, between 60 and 70% of tropical plywood consumption is of commodity-type panels.

Commodity-type panels

These panels, as mentioned above, are used largely in the construction sector and for packaging and cheap joinery, especially in Asia. They are usually required in a small range of sizes (large majority is 4' x 8'), standard grades, and only a few thicknesses. The main driver is always price. Volumes per order and per delivery can be high. Producers can reduce production costs by standardizing production lines.

Special panels

These panels are also used in construction, but for more sophisticated uses; they are also used in the manufacture of trucks and containers. Joineries and furniture industries use these panels in high-quality work. Characteristics of these panels include non-standard sizes (although standard sizes are also used) and many special thicknesses. Grades must be adapted to each special use. Purchases are made in small quantities and with precise deliveries. In general there are two main drivers for the purchase of these panels:

- appearance (an especially strong driver for panels used by furniture industries); and
- performance (special sizes, grade, resistance, etc, for panels with technical uses).

Demand for special tropical plywood panels has not decreased; therefore, these panels remain competitive, while commodity-type panels are suffering more.

Is it possible to shift production from commodity-type panels to special ones?

The reply to this question is positive, but producers must follow or create the clients' demand. Tropical plywood producers can learn from the historical experience of birch plywood producers, who, in a process developed over many years, shifted from production that was mainly commodity-oriented to one that is mainly specialty-oriented.

Many years ago, birch plywood factories mainly produced a few sizes of standard items. Producers were forced by the lack of clear birch faces to find new solutions, and they started to produce film-faced panels, initially for concrete forming and subsequently for other uses. Market research and product innovation created new special panels. Sizes became more and more diversified. New synthetic faces were added. Marketing became a powerful tool and new markets or new needs were identified. Producers also needed to keep costs under control, and they shifted part of their production to cheaper producing countries. Plants became more and more sophisticated and automated.

This process of transformation of standard panels to special panels took many years and during the process many weaker industries closed down. The process was driven by different forces:

- the lack of clear faces;
- market research;
- technology of production lines;
- technology of faces;
- glue improvement;
- creation of new markets; and
- etc.

In a similar way, tropical plywood producers, now heavily reliant on commodity items sold mainly to traditional markets, can start to differentiate a part of their production.

Tropical plywood competes with many different products, and with each of them it needs special policies:

- construction composite panels;
- hardwood edge-glued panels;
- softwood edge-glued panels;
- temperate hardwood plywood (birch, poplar, beech and other);
- MDF;
- softwood plywood;
- OSB;
- chipboard; and
- non-wood panels and products.

There are problems limiting the competitiveness of tropical plywood. We have seen that tropical plywood can be competitive when it covers niche markets, while it is less competitive as a commodity.

Problems related to the market include:

- the distance from some consuming markets (North America and Europe);
- the image of tropical plywood in some world markets (environmental issues);
- regulations in producing countries (uncertain contracts); and
- future availability (increasingly scarce).

Each of these problems must be matched and sellers must find solutions that are tailored to the product and the market segment.

Problems related to producing industries include:

- some large producers often have rigid production lines and sales policies;
- smaller producers are far from some markets and have limited financial and market capacity'
- other wood-panel industries (MDF, OSB, etc) invest heavily in technical and market research; and
- other wood-panel industries have powerful associations lobbying on norms, standards and other non-tariff barriers (and also tariffs).

An analysis of these issues allows the preparation of a SWOT (strengths, weaknesses, opportunities, threats) analysis for tropical plywood. Since we consider tropical plywood to be a unique item, in this short paper the SWOT analysis considers only very general issues.

Strengths

- Relatively large availability of clear faces
- Different species available, well accepted in consuming countries
- Good technical characteristics of main species (weight, strength, durability …)
- Large depth of experience among main producers

Weaknesses

- Decreasing log availability
- Environmental problems
- Distance from some main consuming markets
- Difficulties created by local rules in some producing countries (uncertain contracts)

Opportunities

- Markets will require growing quantities of high-tech wood products
- Growing population and income in surrounding countries
- All the opportunities created by light-weight panels with clear faces

Threats

- Competing items, cheaper and with high performance
- Environmental pressures
- Lobbying of associations promoting alternative materials

Conclusions

It is SURE that future tropical plywood production will decrease, due to log shortages. Therefore, the policies of producing companies must consider that they are active in a shrinking producing market (while consumption is growing).

Tropical plywood production is SMALL compared to the overall wood-panel market. We have seen that tropical plywood production is about 10% of total wood-panel production. This fact leads to the conclusion that tropical plywood producers, even in areas where they have a much stronger position, such as in some Asian countries, can't make policies suitable to companies dominating the market.

Tropical plywood has a TREMENDOUS COMPETITIVE ADVANTAGE compared to most other items – the potential to produce good percentages of large clear faces. Tropical plywood producers facing everyday problems due to the scarcity of good faces might smile at this sentence. However, spruce plywood producers, or producers of birch, eucalyptus, poplar plywood have much bigger problems.

Price is and will remain a very important driver in the purchasing process of all wood panels. Therefore, tropical plywood producers must remain competitive, price-wise. However, being competitive in a niche of high quality is different to being competitive with the cheapest mass products sold into a market.

Some wood panels are already cheaper than tropical plywood – chipboard, OSB, MDF. These products, thanks to many technological advantages and the larger availability or raw material, will always be competitive with tropical plywood.

Tropical plywood also finds aggressive competitors in the upper market range, such as temperate hard-wood plywood (birch, beech), the highest-quality softwood plywood, some edge-glued panels, composite panels, etc.

In this situation of extreme competition, and knowing that most tropical plywood producers cannot follow the option of increasing production due to a lack of raw materials, what are the best policies for keeping market share and profitability, especially in the rapidly growing Asian markets?

- The largest tropical plywood producers, which are often powerful companies, can further differentiate their production range, adding capacity in items not requiring high-quality logs such as chipboard and OSB, and adding value to plywood production
- ALL tropical plywood producers must invest in order to create powerful associations by which they can lobby worldwide and defend the interests of tropical plywood (not just the interest of companies in individual countries). The problems created by environmental concerns, norms, standards, non-tariff barriers, etc, are global problems. It is useless to defend production or consumption in one country and not defend production and consumption for all countries
- ALL tropical plywood producers, including smaller companies, must differentiate their production, looking more into niche markets. Production cannot shift from mass products to special products overnight, but any quantity added to the special products will add value to producers and decrease the problem of competitive pressure on mass items
- It is necessary to become flexible. Many tropical plywood producers have rigid production processes in order to keep costs under control. More flexibility is needed

- We have seen from our analysis of the process of differentiation of birch plywood that research and marketing are immensely important. All the large OSB and MDF producers spend considerable amounts of money in these areas; new products must be created, new markets must be identified and new needs must be satisfied. Tropical plywood producers, with few exceptions, spend far too little in these areas; they seem content with existing markets/products and do not try to find something new

A last word concerns the future availability of tropical logs.

This paper started with the considerations that tropical logs are scarce and that production will decrease in the future. Most competing wood panels are produced out of easily renewable logs: softwood, poplar, birch, *Eucalyptus*, etc. This is a weakness of tropical plywood producers. Tropical countries can grow many wood species very fast. Large plantations are often established thanks to government assistance, but there is often no direct linkage between the planted areas and the companies that will use the planted wood a few years later. Therefore, some large planted areas do not produce wood of high commercial value.

Plywood producers must select the species that are most suitable to their production and promise the best growth in their area and plant what they will need. It is a relatively short-term investment that could guarantee much greater production in the future: industry associations and governments must carefully evaluate this opportunity.

Adding more value to tropical plywood by innovative products*

Giorgio Agnolotti
Alpi S.p.A., Italy

Alpi decorative wood surfaces

A successful group

The company, established by Pietro Alpi, began as a cabinet-maker shop in 1919. In 1950, following the development of the industrial furniture industry, Alpi production changed to prefabricated panels. Some years later, it turned to the current technology of manufacturing multilaminar wood.

Linteco Division was created in 1967 to translate multilaminar wood into more technologically advanced products. In 1975, Alpi moved to Cameroon and established the subsidiary company AlpiCam to optimize the exploitation of wood sources and to provide a continuous supply of raw material like plywood, veneer and sawn lumber boards.

Alpi Group, the world leader in multilaminar wood

The Alpi Group is the world leader in the production of multilaminar wood. This leadership is the result of an ongoing commitment to provide a product which is a synthesis of innovation, technological research, quality and creativity. Success has been attained even while Alpi pays careful attention to the environment and natural resources.

Our mission

Our mission is to satisfy the demand of decorative wood surfaces by manufacturing products with innovative, aesthetical and technological characteristics to meet all market requirements with the highest respect for the environment and natural resources.

Alpilignum

Alpilignum, the Alpi multilaminar wood, is produced using an exclusive technology that permits the recreation of every wood essence existing in nature, even the rarest and finest ones. Alpilignum maintains the natural characteristics of traditional wood but has several advantages over it, including:

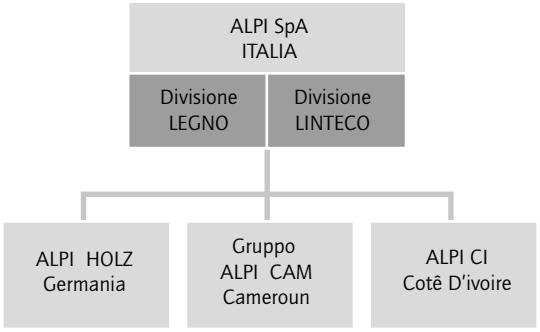
- absence of the typical wood defects;
- color and grain consistency; and
- higher yield and minimum waste.

The Alpi Group

With two plants in Italy, a group of subsidiaries in Cameroon and Côte d'Ivoire for processing raw material and a network of worldwide distributors, Alpi Group is currently one of the top one thousand companies in Italy (Figure 94).

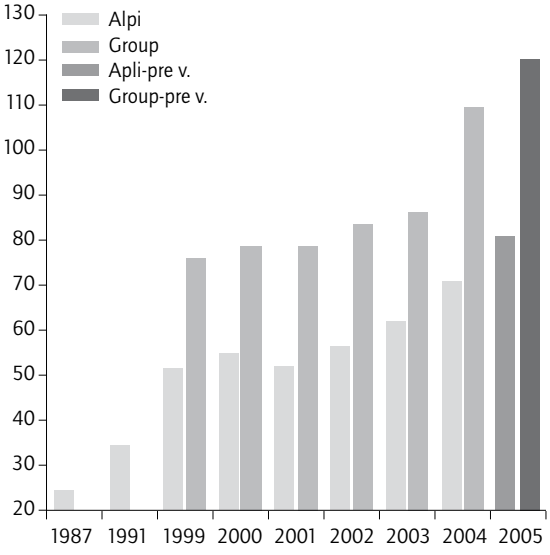
Production sites: 6
Surface area of sites worldwide: 510,000 m^2

Figure 94. Alpi Group structure



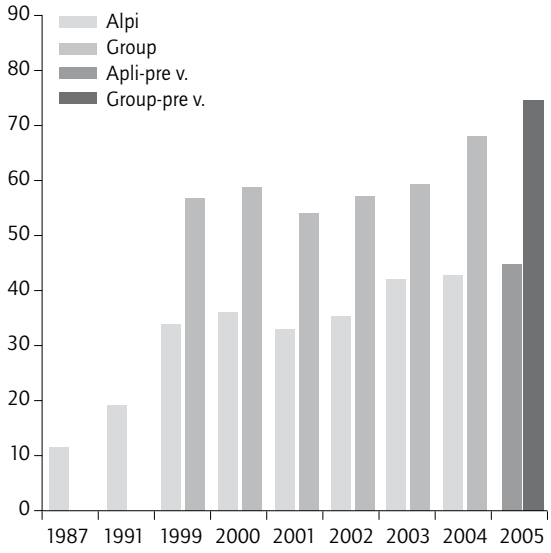
Consolidated turnover (year 2004): US$134 million
Export turnover (year 2004): 80.4 %

Figure 95. Alpi Group total turnover (€ million)



** Text prepared by the editors based on a Powerpoint presentation given at the conference*

Figure 96. Alpi Group export turnover (€ million)



Human resources

Alpi Group employees (year 2004): 2,220 (Figure 97).

Distribution network

Alpi Group is a constantly growing company, with a presence in more than 70 countries.

Raw material

For the production of Alpilignum, Alpi S.p.A. uses poplar from Italian agricultural plantations and ayous (*Triplochiton scleroxylon*), also called obeche or samba, a very common tree growing in a wide area of tropical Africa.

Forest activity in Africa

Since 1975, Alpicam has guaranteed continuity to Alpi Group in the supply of raw material and today it represents a leading industry in Cameroon, with more than 1,300 employees. AlpiCam includes three different processing plants with industrial and commercial activities, producing veneers, plywood and sawn lumber boards. Alpi C.I., located in Côte d'Ivoire, is a floating plant mill built over a towable barge. It mainly supplies rotary cut veneers for export and has been since 1987.

The supply of ayous in Cameroon

The supply of raw material occurs through the subsidiaries AlpiCam and GrumCam operating in compliance with local forest regulations, which requires the application of detailed forest management plans (Law No 94/01 – Decree 95/531 and subsequent amendments). The logging plan is based on principles of sustainable management, with reduced environment impact defined by pre-established criteria.

Forest activity in Africa – criteria for correct forest management

Selective cutting: only a certain number of trees previously selected according to their diameter are harvested. On average, no more than one tree per hectare is felled.

Respect for natural growth rates: a given area of forest can be harvested at regular intervals of about 30 years to accommodate the regular growth rates of trees.

Figure 97. Alpi Group total employees

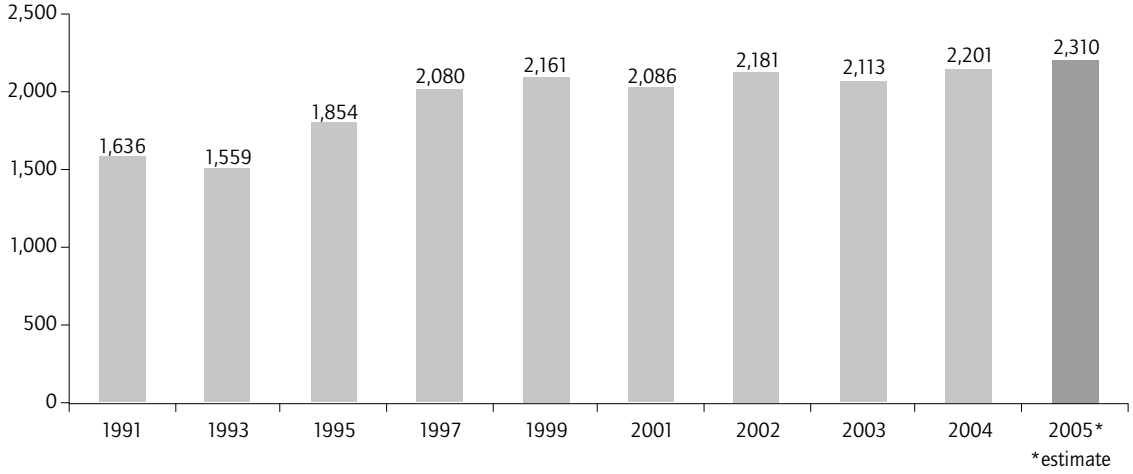


Figure 98. A forest trail
a) just after the logging season;
b) after three months;
c) after eight months

a *b* *c*

Waste minimization: all available methods to achieve a maximum yield from each felled tree are used. Logs are shipped to the Douala plant for the production of veneer, plywood and sawn lumber boards; wood waste is used to produce thermal energy.

Protection of the surrounding forest: directional felling is applied to avoid damaging surrounding trees.

Protection of low-lying vegetation: felled logs are moved with wheeled vehicles to minimize damage to low-lying vegetation.

Protection of the soil: roads used for log removal are appropriately sized.

Protection of water sources: only trees located at a distance of 100 m or greater from water sources are felled in order to preserve catchment values. Temporary bridges and/or pipes are also used to avoid water stagnation and/or pollution, even in cases of low water flows.

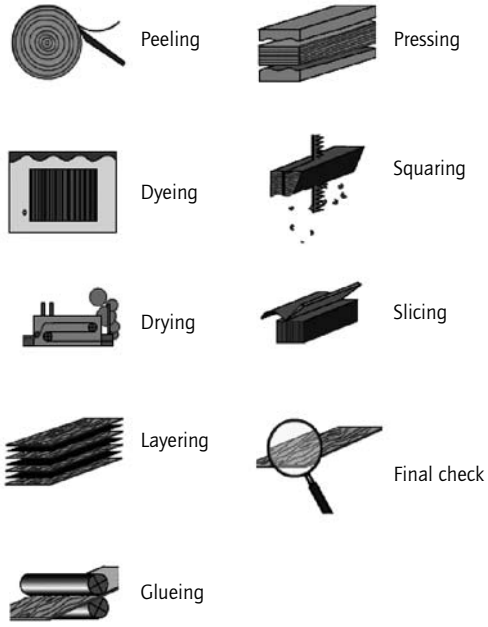
Forest inventory: inventories are carried out to enumerate the available trees in the forest and identify those to be felled. Precise mapping is assured by using global positioning systems.

Rights and benefits of local populations: in addition to complying with Cameroonian laws regarding the rights and benefits of local populations living in the forest, AlpiCam and GrumCam are the sole employers in these remote and thinly populated areas. Workers and their families are provided with free housing and a health service. Forestry is the only activity enabling the decentralization of production in the eastern regions of Cameroon, thus limiting social degradation and uncontrolled urbanization.

As shown in Figure 98a–c, this limited period of time was sufficient to allow the complete re-growth of the forest vegetation and to cover any sign of man's passage.

The Alpilignum manufacturing process

Figure 99. The Alpilgnum manufacturing process



Peeling and dyeing

Logs are peeled with a rotary cut machine and then selected before dyeing. In the dyeing process, Alpi utilizes water-based dyes which are free of chrome and other heavy metals. These dyestuffs, commonly used by the textile and fabric industries, are non-toxic and not dangerous to the environment.

Drying

Dyed sheets are dried with hot-air dryers to remove excessive moisture.

Layering and gluing – pressing and squaring

Dried veneers are mixed and piled up for gluing. Then they go through a glue spreader and are pressed into special moulds. After glue-hardening, the pile of glued sheets becomes a solid wood log with a geometric shape (3,400 x 650 x 650 mm). The Alpi log is ready to be sawn or sliced.

Slicing and final check

Alpilignum veneer can be supplied in thousand of forms, just like traditional wood. It can be supplied in different grain patterns, such as straight grain, flat cut, quarter cut, burl and bird's eye patterns, or creative bright textures. Every flitch or solid log is checked with accurate quality controls.

Alpilignum patterns

Alpilignum is produced to order. There are more than 15,000 different combinations of textures and colors.

Alpilignum pluses

1. Large standard sizes up to 900 x 3,400 mm
2. Absence of the typical defects of traditional wood
3. Consistency in size, color and grain
4. Application and finishing are the same as for traditional veneers

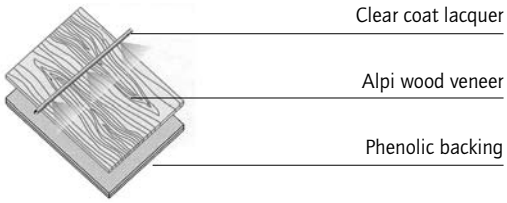
Alpi Linteco Division

Alpilignum sheets are transferred to Alpi Linteco Division to be laid-up with wooden or flexible backings for edge-banding production, or laminated to make Wood HPL Decorative Panels.

Alpikord: Pre-finished veneer built into a high-pressure laminate

Alpikord is obtained by bonding Alpilignum veneer at high pressure with a phenolic core, and then finishing with a clear-coat lacquer (Figure 100).

Figure 100. Alpikord pre-finished veneer



Alpikord applications

Alpikord pre-finished veneer is suitable for all interior surfaces where the look and warmth of real wood is specified and the ease of a laminate installation is desired. The most common uses include: office systems, residential and contract furniture, architectural panelling, kitchen cabinets, store fixtures, interior doors, shipyard furniture, and elevator cab and vehicle interiors.

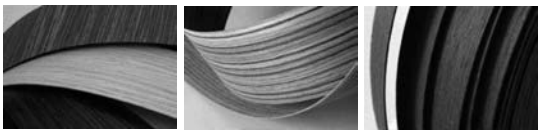
Alpikord AFF

Alpikord AFF is the first pre-finished HPL veneer certified as IMO-MED (Mark of Conformity by the International Standard for Safety and Performance Requirements for ship manufacturing).

Alpilignum Edge-banding

Alpilignum Edge-banding is available with wooden or special backings for soft and post-forming applications. Moreover, each kind of Alpilignum is offered, such as high-thickness multi-ply edge.

Figure 101. Examples of Alpilignum Edge-banding



Research and development

Every day, two research and development laboratories carry out analysis of all raw materials and develop new solutions in order to improve the technology and quality and ecological value of Alpi products. Particular attention is paid to controlling industrial cycles and waste treatments.

Environment and ecology

Alpi Group has always implemented an active environmental policy that respects nature and dedicates a special effort to the working environment.

Formaldehyde emissions

Alpilignum veneers conform to tough European regulations on formaldehyde emissions, E1; they are certified by C.A.T.A.S. and are recognized by the German Institute WKI.

'VERO LEGNO' Trade Mark

Alpi S.p.A. is one of the founder members of 'VERO LEGNO' (REAL WOOD), the Italian association protecting and promoting wood products since 1997.

Alpilignum products applications

Thanks to its technological innovations, excellent quality and ecological values, Alpi products play an important role in furniture manufacturing. Architects, interior designers, contractors and woodworkers can use them for an unlimited number of applications because they allow wide design creativity, being easy to handle and apply to any kind of project.

ENHANCING THE VALUE OF WOOD HAS ALWAYS BEEN OUR GOAL.

Session IV: The Raw Material Supply: Sustainability and Accountability

A plantation-based industry, or logging natural forest?

Jean-Jacques Landrot, President
ATIBT, Paris, France

Introduction

Of the 250 million hectares of forest in Africa, about 50 million are allocated by the African states to production forestry and between 15 and 20 million are set aside in protected areas for which the objective is biodiversity conservation. For example, the Congo Basin is habitat for some 400 mammal species (including four of the world's six ape species) and 10,000 species of higher plants, of which more than 3,000 are endemic.

Even though forestry laws now demand that concessions establish a preliminary forest management plan, for political, economical and technical reasons the reality it very different. In Africa today:

- only 20 million hectares are engaged in the management process and are carrying out their forestry inventories;
- approximately 3 million hectares are under a forest management plan accepted by a state administration;
- 1.6 million hectares are certified in Gabon by the Dutch system, Keurhout and ISO 14001, giving the products originating from these forests the right to be sold with certification labels; and
- neither FSC nor PAFC/PEFC is operational yet in Africa.

In order to study the competitiveness of tropical plywood from both supply sources – natural forests and plantations – the following aspects are discussed:

- environmental issues;
- economic benefits;
- industrial aspects;
- export and international trade aspects; and
- accounting aspects.

Environmental issues

Natural forests

One of the big challenges for producing wood from African tropical forests is to move away from the path of mining behaviour towards the controlled management of the resource. Even though it seems presumptuous, if not Utopian, to speak of maintaining biodiversity under management plans, efforts are really being made towards this very objective. Nevertheless, the great richness of tropical forest biodiversity makes the work that is carried out very complex and expensive.

The burden of these expenses is difficult to bear in a situation of international competition. The richness of biodiversity and the several hundred species of commercial timber also make inventories complex and expensive (about US$5 per hectare) and, in addition, places a heavy responsibility on the planning of forest production. It is necessary to take into account not only the 5–10 main and more valuable species but also about 100 other different commercial species.

The result is very clear: for one hectare opened up in primary forest, sustainable management obliges the harvesting of 50–100 different species. This is really the new challenge in Africa, which, unlike Southeast Asia and South America, has a very weak local market.

In Gabon, for example, okoume was harvested exclusively during the first 50 years of the last century, and mixed with ten other species during the second 50. Okoume is still the main species harvested, representing more than 70% of the total volume of production.

To talk about the environmental issues associated with natural forests without mentioning the pressure put on by NGOs would be incomplete. Some of the pressure is positive and cooperation on social and biodiversity aspects is very useful. However boycotts of tropical timber made by some European NGOs are very damaging to developing countries.

Plantations

It seems that there are fewer environmental constraints on plantations. Eucalyptus species, Pinus radiata and numerous African species such as fromager, frake and obeche can be planted and harvested 25–60 years later. However, biodiversity is very poor and problems such as groundwater levels and animal habitats need to be considered and taken into account.

Economic benefits

Natural forests

If we exclude the problems of infrastructure and establishing a management plan, it can be said that the stock of standing trees in natural forests is available and many people call this opportunity 'a gift from nature'. We know that the reality is different, but it is true that large diameters and mature trees are an opportunity if you don't take into account the real costs of accessing the gift.

Plantations

Last year during a meeting in Kuala Lumpur, Malaysia, I was very surprised by a speech made by a Brazilian speaker who invested capital and worked in both types of forests: natural and planted. He stated that when we compare returns on investments over the long term, there is no doubt that plantations are more profitable, with a turnover of about 20 years: one species in large volumes per hectare, homogeneous size and wood texture, and finance available through carbon funds. In addition there is no pressure from NGOs.

Economic and social constraints

The economical advantages of both natural and plantation forests have just been detailed. However, for forests located in developing countries there are numerous constraints. We all know that the reality is quite difficult in Central Africa and I will mention the main constraints we have to face.

Natural forests

- Lack of infrastructure, including roads, airport, camps, etc
- Requirements for sophisticated inventories, including studies on populations, biodiversity and non-wood products
- Small volumes per hectare, which means a high cost of infrastructure per cubic metre of production
- Relationships with village populations: this point is one of the most sensitive in Central Africa, especially in areas where there is high population density (50 habitants or more per km^2). Ownership of the forest, the standard of living, traditional rights – all highly sensitive and certainly a big handicap for natural forests
- Distance of transport: the distances between forest concessions are large and transport is generally by truck. In several countries, such as Gabon and Cameroon, railways offer a partial solution to transport but are not reliable. The same risks apply to rafting logs down the river

Plantations

In African countries, plantations are only allowed in degraded forests and therefore are close to human activity; generally speaking, infrastructure is in place and relationships with populations are good because the ownership of the land is clarified before establishment. Local populations are generally hired as workers, which facilitates the relationship with investors. Today, three African countries – Côte d'Ivoire, Ghana and Congo – have real plantation programs.

Natural forests and plantations

The same social constraints in developing countries, such as health care and training, apply to both natural forests and plantations.

Industrial processing

Before talking about the technical aspects of processing, it would be good to explore the problem of the long-term investments in countries with a poor reputation (civil war, weak governance, lack of infrastructure, etc). The new main official target of the World Bank and the G8 is the eradication of poverty and development in Africa.

At the same time, it is very strange that no international bank will facilitate long-term investments in the forest sector in Central Africa without an international guarantee – international insurance companies like MIGA are reluctant to offer a guarantee for national forest investment. Even today there is no example of insurance in our sector.

In countries of weak governance, the solution is not to attract bad investors who are recycling money from trafficking but to attract serious investors who are competent and have the capacity to develop long-term and sustainable activities, with added value for the

benefit of the country, the population, workers and the investors themselves. This is why our association is in favour of transferring the international debts of the state into a fund of guarantees for investments (management plans, industry, training, etc).

Natural forests

Figure 102. Processing of logs from natural forests

The large diameters of logs from natural forests are easy to peel and generally give a very long sheet of rotary veneer which is easy to peel and cut with an excellent recovery of up to 60% (Figure 102). In addition, the structure of the wood coming from natural forests is generally stronger than the wood coming from plantations (due to the slower growth in natural forests arising from competition for light). But it is also a fact that heterogeneous diameters – from 50 to 220 cm – require adjustments of the peeling machines, which slows down production.

Plantations

Contrary to natural forests, a plantation produces only one or two species with wood of similar structure and diameter (30–60 cm), allowing automatic production with modern equipment. Generally, using logs of similar diameter increases productivity by up to twofold compared to logs of irregular diameter.

Comparative figures for plywood production

Although very different, it is interesting to compare figures between okoume and aiele from natural forests processed in Gabon (Port Gentil, Owendo) with logs from *Pinus maritima* and poplar plantations (Table 42).

From these figures we can conclude:

- the productivity of plantation logs is double that of natural-forest logs;
- the cost of the raw material from natural forests is around the same as from plantations, except in those large plantations (several hundred thousand hectares) close to factories and ports;
- when we add the price per m^3 of veneer to productivity it is clear that only a few species like okoume or mahogany, which have a worldwide reputation, can compete with plantation species like *Eucalyptus*, pine or poplar; and
- secondary species from natural forests have no chance of competing with plantation species and this handicap will increase in the second rotation when the diameters of the logs will be reduced and consequently the volume per hectare will decline and production costs will increase. The technical and processing properties of secondary species need to be studied and promoted on international markets.

Table 42. Plywood production costs by species (US$/$m^3$)

Variables	Okoume	Aiele	Pinus maritima	Poplar
Cost of log to factory	66	60	64	72
Recovery volume veneer/log	58%	45%	45%	40%
Price of veneer	114	133	142	180
Productivity per hour	15	15	35	30
Selling prices	US$840	US$500	US$432	US$540

Commercialization and reputation in the markets

Natural forests

As we noted, the technical qualities of natural-forest plywood are excellent. Unfortunately, even with SFM production the environmental image is increasingly negative (Figure 103).

Figure 103. Greenpeace demonstration: "France is destroying ancient forests"

Plantations

The opposite is true of plantations: generally a bad technical reputation, but an increasingly positive environmental image.

Conclusion

Although sustainably managed natural forests is the only way to provide development in forest areas, it is necessary to face the future:

- plantations are the only way of maintaining the competitiveness of plywood factories; and
- plantations are the solution for decreasing the pressure on natural forests

For these reasons, tropical governments must develop plantation programs in degraded forest areas and around the ports where factories are established. But many problems must be solved. These include:

- land ownership;
- loans for investment must be provided and guaranteed;
- a species, or a cocktail of species, must be chosen in relation to the technical quality of the wood and the speed of growth; and
- wood production capacity against fungal and insect attack.

Challenges of certifying tropical plywood for the global market

Chew Lye Teng, Chief Executive Officer
MTCC, Malaysia

Introduction

The share of the total certified forest area held by tropical producer countries has remained below 10%. MTCC started operation in 2001 using the Malaysian Criteria and Indicators (MC&I) 2001, which are based on the ITTO Criteria and Indicators. This year (2005) is the transition year for a change to the MC&I 2002. Nine forest management units (FMUs) and 66 timber companies (including three tropical plywood manufacturers) have been awarded the MTCC certificate. The implementation of timber certification results in a higher unit cost for tropical plywood. The challenge faced by MTCC is to ensure that its scheme is accepted under the timber procurement policies of importing markets. Developed countries have a vital role to play by accepting a phased approach in timber certification. Their timber procurement policies should accept all credible certification schemes. Producer countries are looking for a 'green premium' for their certified products. So far, this green premium has not been consistent and is often not commensurate with the additional costs incurred. Developed countries should put more effort towards providing the green premium. The national governments of these countries should take the lead by offering a premium for certified products in their timber procurement policies.

The implementation of timber certification began in 1994 with the operation of the first certification scheme under the FSC, and experienced rapid growth in the period 1994–2004. However, despite this fast growth, by 2004 only 6% of the world's forests had been certified. In addition, while forest certification was introduced as a response to combating deforestation in the tropics, the vast majority of the certified forests comprise temperate and boreal forests. Of the total area of certified forests of 222 million hectares in February 2005, 55% was located in North America and 40% in Europe, while the regions with tropical forests – Latin America, Asia-Pacific and Africa – accounted for only 2%, 2% and 1%, respectively. The share of developing countries in the total certified forest area has remained consistently well below 10% (de Abreu & Simula 2005).

Such a situation is ironic, given that certification was conceived as a market-linked tool to particularly encourage the sustainable management of tropical forests. Even among tropical forest countries it has proven easier to certify plantation forests compared to natural forest management, to the extent that more than 50% of the total tropical certified area comprises planted forests (de Abreu & Simula 2005).

Challenges in certifying tropical natural forests

There are two principal reasons why certification is having such an insignificant impact on forest management in tropical countries. First, the tropical countries are mainly developing countries, which face competing demands for inadequate and limited resources in meeting crucial national needs such as poverty alleviation, food security, employment opportunities, public health, education and housing.

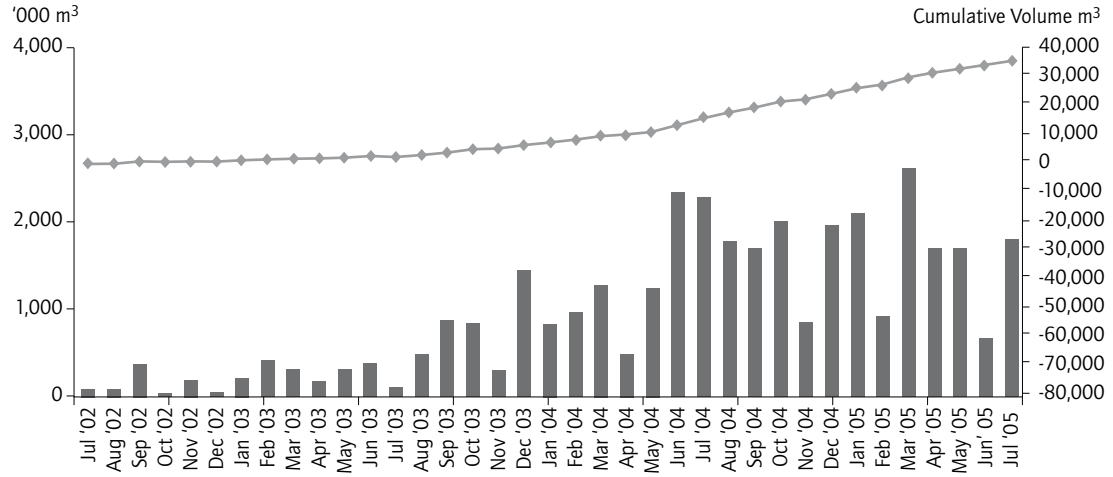
Second, these countries are dealing mainly with natural tropical forests, for which the requirements of sustainable management are much more complex and demanding than for non-tropical forests. As a result of these constraints, there is a considerable gap between the actual level of management and what is required by certification in developing tropical countries. These countries are therefore unlikely to be able to comply with the requirements of the certification standard in one step.

Therefore, the concept of a phased approach to certification has been introduced to provide an arrangement under which full compliance with a particular standard is divided into a series of phases or steps, thereby enabling tropical timber producers to gain recognition for their efforts in implementing and achieving certification. Such a phased approach involves the stepwise, independently verified implementation of the requirements of the standard, usually within a time-bound action plan for the FMU.

Implementation of the MTCC timber certification scheme

The MTCC was established in 1999 as an independent organization to develop and operate a voluntary national timber certification scheme in Malaysia. Its aim is to provide independent assessments of forest management practices towards achieving SFM as well as to meet the demand for certified timber products.

Figure 104. Export of MTCC-certified timber products



Source: MTIB

MTCC started operation of its timber certification scheme in October 2001 using a forest management standard entitled the *Malaysian Criteria, Indicators, Activities and Standards of Performance for Forest Management Certification* (MC&I 2001), which is based on the ITTO *Criteria and Indicators for Sustainable Management of Natural Tropical Forests* (ITTO 1998).

2005 is the transition year for the change from the use of the MC&I 2001 to a new standard, the *Malaysian Criteria and Indicators for Forest Management Certification* (MC&I 2002). This standard has been developed through multi-stakeholder consultations using the principles and criteria of the FSC as a template.

The standard for chain-of-custody certification used by MTCC is the *Requirements and Assessment Procedures for Chain-of-Custody Certification* (RAP/COC). MTCC plans to use a revised version of this standard, the *Requirements for Chain-of-Custody Certification* (RCOC), in 2006.

To date, nine FMUs (eight in Peninsular Malaysia and one in Sarawak) covering a total of 4.73 million hectares of Permanent Reserved Forests have been awarded the Certificate for Forest Management. The certified area represents about 33% of the total Permanent Reserved Forests in Malaysia. As of August 2005, 66 timber companies have been awarded the Certificate for Chain-of-Custody. Of these, three companies are manufacturers of MTCC-certified tropical plywood.

Following the operation of the MTCC scheme, the first shipment of MTCC-certified timber was exported in July 2002 to the Netherlands and, since then, the export of MTCC-certified timber products has increased steadily. By the end of July 2005, a total of 35,419 m^3 of MTCC-certified sawn timber, mouldings, laminated finger-jointed timber and plywood has been exported to seven countries: the Netherlands, Belgium, Germany, the UK, France, Greece and Australia.

Challenges in certifying tropical plywood under the MTCC scheme

To a large extent, Malaysia faces the same problems encountered by other developing tropical countries in their efforts to manage natural forests in a sustainable manner. In implementing timber certification to meet the requirements of the MC&I, environmental, social and economic aspects of forest management need to be given attention in a balanced manner.

In preparing to undergo the forest management certification process, the manager of the FMU will have to implement a host of measures to meet the requirements of the MC&I. The amount of additional work and the associated direct and indirect costs will depend on the current practices of the FMU and how near they are to the requirements of the MC&I.

The FMU manager will need to improve the documentation of forest management practices within the

FMU, take more care in planning and implementing its activities, and ensure closer monitoring of its field operations.

At the same time, the output of forest products, principally logs, have to be adjusted to a lower level in order to ensure long-term sustainability. Such a situation inevitably results in a higher cost per unit volume of output of the forest product. In addition to these indirect costs of achieving SFM and timber certification, the FMU manager will incur direct costs while undergoing assessment for forest management certification. Under the MTCC scheme, the cost of the main assessment has ranged from US$16,800 to US$32,400, depending on the size of and logistical problems encountered in assessing the FMU.

One of the fundamental requirements for complying with the MC&I is the availability of a sufficiently comprehensive forest management plan for the FMU. The high cost involved in preparing such a comprehensive plan, compared to one associated with conventional logging, has been identified as one of the constraints to the implementation of SFM (Manggil et al. 2005).

Manggil et al. (2005) also pointed out that operational costs are higher in implementing the components of reduced impact logging, such as tree marking and mapping, directional felling and the proper alignment of skid trails. On the other hand, the expected volume extracted is much lower compared to conventional logging. Attention to social aspects, such as implementing socioeconomic projects for the indigenous communities living in the vicinity of the FMU, and other environmental aspects, such as biodiversity conservation, also result in higher costs.

Chan (2005) highlighted the general opinion that the increased cost of production, and lower productivity due to restrictions of SFM, is not compensated by better premiums on prices for the logs produced.

A study by Mohd. Shahwahid et al. (2000) estimated the average total cost of harvesting activities to achieve compliance with the MC&I to be US$52.24 per m^3 of timber production, compared to US$30.80 per m^3 for conventional logging, representing an increase of nearly 70%.

With regard to chain-of-custody certification, the MTCC scheme allows for two systems: 'physical separation' and 'inventory control and accounting for wood flows'. However, regardless of the system adopted, the plywood manufacturer needs to have in place the necessary means and records for tracking the certified material as it is being processed into certified plywood. This requirement, together with the resultant decrease in output due to the additional work, translates into a higher manufacturing cost for certified plywood. In addition, the direct cost of chain-of-custody certification is approximately US$1,050–1,600, depending on the scale of the operation.

Other than the additional costs mentioned, companies also face challenges such as insufficient supplies of certified logs during the initial stages of the certification scheme. In such a situation, the manufacturer needs to accumulate the certified logs in order to process and supply the certified plywood in commercial quantities; this extra work may not be economically feasible, especially in the absence of a green premium for the certified plywood.

In Malaysia, the implementation of timber certification is both country-driven and market-driven. It is country-driven because there is increasing interest and concern among Malaysians that our forest resources should be managed sustainably so that they can continue to provide their valuable goods and services for the benefit of the nation. At the same time, timber certification is market-driven, since the timber industry is largely export-oriented and there is increasing demand for certified timber products, especially in markets such as Europe, the US and Australia.

From a marketing viewpoint, ensuring continued access to the market is the main motivation for implementing timber certification. The challenge here is to ensure that the MTCC scheme is recognized and accepted under the timber procurement policies of importing markets. Currently, the policies of many developed countries, both in the public sector at national and sub-national levels, and in the private sector, are exclusive in nature and either prohibit the use of tropical timber products or allow their use only when the products are certified under certain preferred certification schemes.

The consumer countries have a vital role to play in promoting SFM by recognizing and accepting the phased approach to timber certification adopted by some producer countries. One example is the Government of Denmark, which has included in its public procurement policies a three-tier system for evaluating certification schemes as follows:

(i) legal and sustainable;

(ii) legal and progressing towards sustainable; and

(iii) legal.

Under this approach, the MTCC scheme is currently listed as one of the schemes at level (ii).

Another example is the UK Government Procurement Policy, in which there is a contract condition to ensure the supply of timber from legal sources and a variant specification for the option of supplying sustainable timber. Following an assessment of five timber certification schemes, including MTCC as the only scheme from a tropical forest country, the MTCC certificate has been accepted as providing an assurance of legally harvested timber.

The pragmatic approach taken by Denmark and the UK is both commendable and necessary for encouraging the serious efforts needed to achieve SFM. A similar approach should be taken by other governments, especially in those developed countries that import significant quantities of tropical timber products.

It is also important that timber procurement policies should be inclusive in nature and able to take on board all credible certification schemes. They should avoid giving favour to any particular scheme; otherwise, the present situation, in which tropical forests account for less than 10% of the total area of certified forests, will persist.

The second market-related issue is the expectation of producer countries that certified products will obtain a green premium in the form of higher prices so as to offset the higher cost of production and also as a recognition of their environmentally friendly credentials. So far, however, the availability of a green premium is inconsistent and often not commensurate with the additional costs of producing and exporting certified products. It is important to reiterate that for the tropical forest countries, timber certification is a difficult, costly and time-consuming process due to the considerable financial and technical constraints faced by these countries. Additionally, the management of these tropical natural forests is more challenging and demanding compared to temperate and boreal forests. Besides having to deal with rich biodiversity, managers of tropical forests must also take into account the indigenous communities who still live in the vicinity of the forests and depend on it for its goods and services.

Developed timber-consuming countries should put more effort into providing a green premium, not only at the national level but also at the sub-national level and by the private sector. The national governments in these countries should take the lead by offering a green premium for certified products in their timber procurement policies.

Conclusions

Tropical producer countries face considerable challenges in their efforts to manage their forest resources in a sustainable manner and to implement timber certification. Despite these difficulties, forest managers and timber product manufacturers in Malaysia are very serious about meeting the market demand for certified products, including tropical plywood. MTCC-certified tropical plywood is now available on the market.

The developed countries that provide the main demand for certified products must encourage these efforts by accepting certified products from all credible timber certification schemes, including that of the MTCC. Countries or schemes that are implementing timber certification using a phased approach should also be encouraged through the acceptance of their timber products by the market. The public procurement policies for timber products in developed consumer countries can play a very important role in ensuring this. In recognition of the efforts involved and the higher costs incurred by forest managers and timber product manufacturers in supplying certified products to the international market, public procurement policies in developed countries should take the lead in offering a suitable green premium for certified products, especially certified tropical timber products.

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Tropical plywood production based on plantation timber: the Brazilian case

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Introduction

Most of the logs used by the tropical plywood industry in Brazil come from natural forests. The country has extensive areas of natural forests that could be managed sustainably, but increasing costs, environmental pressure and growing limitations on access to these resources are making the tropical plywood industry search for alternatives.

Plantations are one alternative, but most of the plantations in Brazil are pines and eucalypts located in the southern part of the country. Eucalyptus has been found to be a promising alternative to tropical logs from natural forests, but there are still some limitations, mostly intrinsic to the wood properties of the species, for use on a large scale.

Plantations of parica, a native species from the Amazon already planted in Brazil and other countries of the region (particularly Ecuador), is another potential option. Around 100,000 hectares of this fast-growing species are planted in Brazil. Four- to five-year-old thinnings with diameters of over 20 cm can be used for veneer production. The total rotation for this species is expected to be around ten years. In spite of the good prospects, however, some silvicultural problems still need to be solved. Ecuador lost extensive areas of parica plantations in the past, and some plantations have also been affected by insects and other sanitary problems. The Parica Research Centre in Brazil is working with the support of the plywood industry to solve the problems, mitigate risks and increase the productivity of this species.

Another alternative for the plywood industry is teak. Teak does not grow as fast as parica (total rotation is expected to be 20–25 years), but it can produce a very valuable timber for sliced veneer to be used in the plywood and furniture industry. In ten years' time, Brazil is expected to have over 100,000 hectares of very productive teak plantations that will help to supply the demand for quality woods in the tropical plywood industry.

Experience gained by the industry suggests that those moving out of natural forest supply will have competitive advantages in the future. However, they need to be conscious that besides investing in plantations it will be necessary to invest in technology and equipment, as industrial operations for juvenile wood and small-diameter logs are different from the current traditional tropical plywood industry.

Forest plantations are increasing in area and gaining in importance, but most of the world's plantations are not tropical. Moreover, a very limited part of the area planted to tropical species is suitable for plywood production. Forest plantations in Brazil cover around 5.5 million hectares, approximately 3% of total global plantations. These plantations are very productive and supply more than 70% of the total industrial wood currently used in the country.

Tropical plywood in Brazil is mostly produced from natural forests. However, increasing costs and both national and international environmental pressures on the use of natural forest logs have made the plywood industry divert to other raw materials, and many mills are now using mostly pine logs from plantations. Pine plywood's share of both total production and exports has grown.

Following the global forest products' industry trend, the tropical plywood industry is looking for alternative sources to ensure its future supply. The move towards plantation wood by the tropical plywood industry has already started and it seems that increasing investment in plantations in the tropics will drive this industry over the next few years in Brazil.

This paper presents information on recent developments related to the use of logs from fast-growing tropical plantations in Brazil and discusses the potential of such plantations to ensure a future supply for the Brazilian tropical plywood industry.

Overview of forest plantations in Brazil

Worldwide, forest plantations cover almost 188 million hectares and are largely concentrated in a few countries, basically in emerging economies. The top ten countries account for about 80% of the world's total forest plantation area (see Table 43), in which Brazil, Russia, India and China play an important role (Tuoto 2005).

Information on these plantations is not detailed or precise, and there are questions about how much of the existing planted area is in production and/or is productive. Also, the majority of the plantations are outside the tropics.

Forest plantations in Brazil cover around 5.5 million hectares, representing almost 3% of the global plantation estate. These plantations are located mainly in the central and southern regions, although there are also relatively large plantations in the north (Amazon region).

Most of the plantations were established in the 1970s as a result of a fiscal incentive program supported by the federal government. This program was designed to support the development of the pulp and paper and steel industries (Tuoto 2005), but in the end it has also favoured the solid wood industry.

The main tree species cultivated are non-indigenous pines and eucalypts, both tropical and sub-tropical. Other tree species include acacia (*Acacia* spp), gmelina (*Gmelina* spp), rubberwood (*Hevea brasiliensis*), teak (*Tectona grandis*) and Parana pine (*Araucaria angustifolia*). These other species make a small contribution to the total planted area – around 4% (Figure 105).

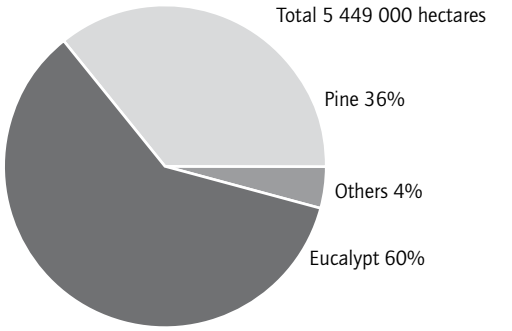
Table 43. Top ten plantation-estate countries

	Forest plantation area	
Country	**'000 hectares**	**%**
China	45,083	24.0
India	32,578	17.4
Russia	17,340	9.2
US	16,238	8.7
Japan	10,682	5.7
Indonesia	9,871	5.3
Brazil	5,449	2.9
Thailand	4,920	2.6
Ukraine	4,425	2.4
Iran	2,284	1.2
Subtotal	**148,870**	**79.4**
Others	38,682	20.6
Total	**187,552**	**100.0**

Source: FAO, adapted by STCP

Eucalyptus species are the most planted trees (60%), the main species being *E. grandis*, *E. saligna* and *E. urophylla*, as well as various hybrids. Pine plantations are mostly based on Southern yellow pines (*Pinus taeda* and *P. elliottii*), but there are also extensive areas of tropical pine plantations (*P. oocarpa* and *P. caribeae*).

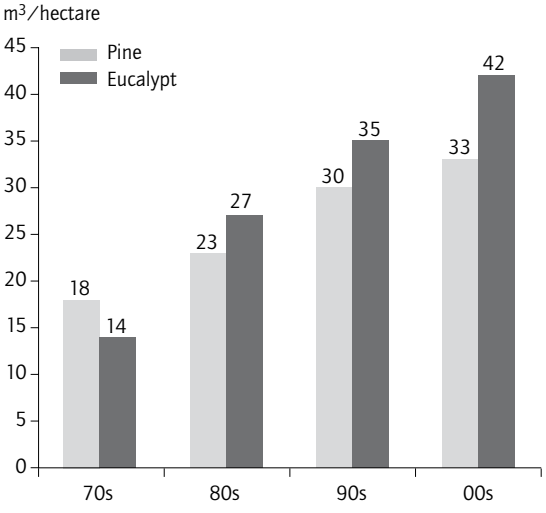
Figure 105. Main tree species cultivated in Brazil, 2004



Source: STCP unpublished and ABRAF

Over the years, the private sector has worked in close cooperation with government research institutes to improve forest plantation productivity and wood quality. Brazilian forestry research efforts to identify and develop high-yield genetic material and improve forest management have enabled the country's tree plantations to achieve the highest productivity in the world. Tree production yields resulting from genetic improvements have more than tripled in the last 30 years (Figure 106).

Figure 106. Evolution of forest plantation productivity in Brazil

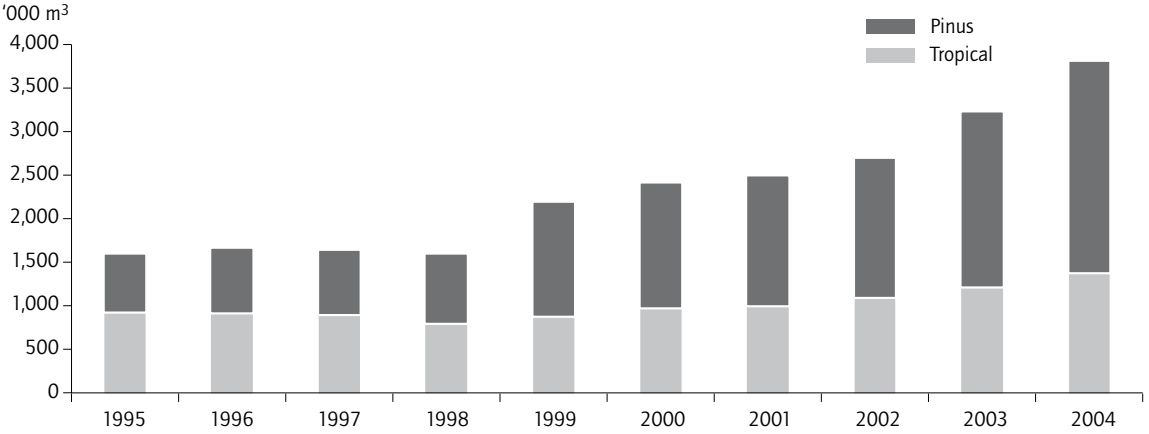


Source: STCP unpublished and ABRAF

On average, new eucalypt plantations in Brazil produce a mean annual increment (MAI) of around 40 m^3/hectare/year, but there are cases of large, intensively managed plantations achieving averages of around 45 m^3/hectare/year.

In extreme cases, clonal eucalypt plantations growing in favourable environments can achieve considerably higher yields. The best clones can grow 90 m^3/hectare/

Figure 107. Plywood production in Brazil, 1995–2004



Source: STCP unpublished

year, but this rage represents the extreme achievements of field trials in specific sites and cannot be generalized to larger areas.

Research has also helped to improve productivity in pine plantations, although not to the same extent. The current average MAI obtained in pine plantations is about 30 m^3/hectare/year. On good sites, new pine plantations are achieving MAIs of 40 m^3/hectare/year or even more.

Well-managed teak plantations located in fertile sites in some areas of central-west Brazil have a productivity of around 15 m^3/hectare/year, and this can certainly be increased through genetic improvement.

The productivity of boreal forests or even of planted forests in Asia (eg China, India, Indonesia and Thailand, among others) is pretty low compared to the MAIs obtained in forest plantations in Brazil. However, even though from a management point of view the low MAI can be seen as a disadvantage, from a wood-quality point of view, slow growth and straight stems produce a more uniform raw material for the forest industry. In some cases, non-uniform wood from fast-growing plantations has been considered a limitation to processing (Tuoto 2005).

Plywood production in Brazil

The plywood industry in Brazil was established in the 1930s, using valuable raw material from native forests located in the temperate southern part of the country. For around 30 years almost all plywood produced was based on Parana pine, a species with very high-quality logs (on average 5 m^3/tree and 20–30 m of clear stem) and of superior wood quality. Land conversion to other uses and the intensive use of this species by the timber industry reduced the availability of Parana pine, and the industry started to use other local non-coniferous species. In the late 1960s, the plywood industry started to move north to the Amazon and, as a result, the production of tropical plywood increased.

At the same time, plantations were started in southern Brazil. With the maturation of the pine plantations, the industry entered into pine plywood production. Figure 107 shows the recent evolution of plywood production in Brazil. In the early 1990s most of the plywood produced in Brazil was tropical. These days over 60% of total production (around 3.7 million m^3 according to 2004 statistics) is pine plywood.

Tropical plywood is produced mostly in the Amazon region and is based almost exclusively on logs from natural forest. There are also mills producing tropical and combi-plywood (tropical faced and pine core) in southern Brazil. These mills import veneer from the Amazon. Pine plywood is produced in the south, although there are also some mills in central Brazil using tropical pine species.

Tropical plywood based on plantation timber in Brazil

The tropical plywood industry in Brazil still relies very much on logs from natural forests. The country has extensive natural forest areas (around 450 million hectares), mostly located in the Amazon region. Of this total, around 80 million hectares are in the hands of the private sector and are in principle the only natural timber production forests of the country.

Government lands in Brazil are not used for production and, in spite of ongoing discussions related to forest concessions, the private sector is a bit skeptical of this option because national polices do not favour productive forests arrangements, rules are not clear, the institutional framework is volatile and the risks are high.

In recent years, the cost of operations in natural forest have increased. New environmental regulations, increases in transition costs, a lack of infrastructure and other factors are reducing the competitiveness of the Brazilian tropical plywood industry.

To overcome the problems, the private sector, learning from pine plywood developments and other initiatives, is willing to move towards forest plantations. Already there have been some interesting experiences, although on a relatively small scale, with tropical species' plantations. Among these, two are examined in this paper: one with an exotic species (*Eucalyptus*), and another with a native species (parica: *Schizolobium amazonicum*).

Eucalyptus plywood from plantations

The main eucalypt species used for plywood in Brazil is *Eucalyptus grandis* and hybrids. This species was originally introduced for pulp production, but changes in forest management resulted in the production of larger-diameter logs that are now available to sawmills and the veneer industry.

Several mills are producing eucalyptus veneer, but still in a relatively small quantity. The reasons for selecting this new raw material are associated mainly with the availability of logs of large diameter at competitive prices, and also the search for market niches, in principle those reluctant to accept tropical timbers. In spite of the apparent availability, log volumes are still limited, but plywood producers entering into this new supply option are confident that the supply of adequate logs will grow in the near future and will be sustainable.

In reality, highly productive plantations can make available straight and long logs (over 30 m) with a diameter of 40–60 cm in about 15 years. Timber properties are adequate for veneer production; densities vary between 400 and 500 kg/m^3, the wood is relatively uniform and has a straight grain and an attractive reddish color. This in principle makes *Eucalyptus* a good option (at low cost) for the plywood industry.

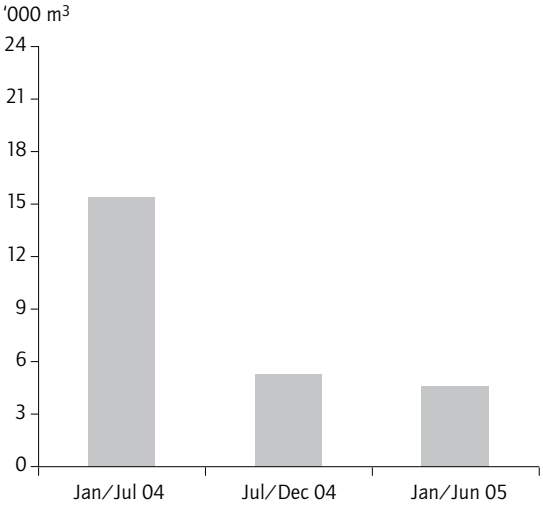
No doubt, Brazilian plantation *Eucalyptus* has the potential to displace some natural-forest tropical timbers. The main reason is associated with the lower cost of delivered logs, but there are other reasons as well. Plantation eucalypts attract less environmental pressure, lower transaction costs and less regulation, all considerations for the tropical timber industry in general and for investors.

There are still problems to be solved. Part of the veneer is of relatively low grade due to knots and other wood defects intrinsic to the species.

Internal growth stresses are quite frequent and are by far the species' main problem; the industry is trying to mitigate them by developing new genetic material. While new stress-free and lower-defect genetic material is not available the option is to work with existing material; a large portion of eucalypt plywood is in fact a combi product (eucalypt and pine), and another part of production is sold as low-grade plywood.

In spite of expectations, *Eucalyptus* is still a small portion of national production. No reliable statistics are available on the national production of *Eucalyptus* plywood in Brazil, but most probably total *Eucalyptus* veneer production is currently under 50,000 m^3 per year. A significant portion of the veneer produced is exported (mostly for laminated veneer lumber). Plywood produced from *Eucalyptus* is partly sold in the domestic market and partly exported. Registered information on recent exports of eucalypt plywood is presented in Figure 108.

Figure 108. Eucalypt plywood exports from Brazil



Source: STCP published

Eucalypt has, no doubt, good potential to replace tropical timber in the plywood industry. However, it is first necessary to solve problems related to wood quality (especially growth stresses). Also, to become an important product the availability of large logs needs to increase. On the market side there is also work to be done: *Eucalyptus* is still recognized as a low-quality product, and this perception needs to be changed in order to increase the value of the product in the market.

Parica plantations for plywood

Parica is perhaps the most interesting of the tropical species used in plantations for plywood production in Brazil. The species is native to the Amazon, but it also grows in Brazil's Atlantic forests. In southern Brazil there is a different species known as guapuruvu (*Schizolobium parahybum*) from the same genus. It seems that the two species have been mixed in the existing plantations in the north, as they are very similar and seeds from the south have been taken to that region in the past. Parica has also been planted in other countries of the region, including Ecuador, where it is known as pachaco.

Parica is a very fast-growing species and is self-pruning, and it produces mostly clear wood. The first parica plantations in Brazil date back to the late 1960s and early 1970s. A study carried out in the early 70s by Richter et al. (1973) identified several parica plantations in southern Brazil with very high productivity.

Also in the early 1970s, a study supported by the Federal University of Paraná analyzed the potential of parica in the plywood industry (Richter et al. 1975). The results obtained in industrial trials were very positive and the industry in the south slowly started to use natural-forest parica logs from the Altlantic forests for plywood production.

Later, in the 1980s, parica plywood was introduced in the market under a different name – pinho cuiabano (*Cuiaba pine*). As a result, the species has three main trade names. In Brazil it is traded as parica in the northeast (Para state) and as pinho cuiabano in the west (Mato Grosso and Rondonia states). In Ecuador, the species is traded as pachaco.

The good results obtained using natural-forest parica for veneer production and observations on the species' growth stimulated the establishment of plantations in northern Brazil over the last 10–15 years.

Currently, the productivity of properly managed parica plantations in Para state is around 25–30 m^3/hectare (Siviero 2004). Trees 5–6 years old can already be used for veneer production (average diameter at breast height is around 20 cm), although the ideal rotation is probably around ten years. In Ecuador, harvesting is normally done when the trees are 15 years old (or more) and have a diameter over 40 cm.

The wood density of these very juvenile parica trees varies between 350 and 400 kg/m^3. It peels well, veneers are tight, and grains are straight and uniform and have a pale cream color. Drying or gluing pose no problems. Surfaces sand well and the plywood produced is not decorative but very attractive.

There is no reliable information on the total area planted to parica in Brazil. However, one estimate is that currently there are almost 80,000 hectares in the Amazon region, but this area is expected to expand over the next years.

The largest parica plantations in Brazil are located in Para state. One plywood company in south Para (Grupo Concrem) has around 15,000 hectares planted to parica. Last year this company started to produce plywood from young parica plantations on a large scale. The results have been very positive; the product is of good quality and is well-accepted in the international market.

In spite of the good results, there are some problems. For instance, Ecuador lost large areas of parica plantation due to sanitary and insect infestations, which ended up killing mature trees. Similar problems have been observed in southern Brazil in the past, and some infestations have also been detected recently in the north.

To tackle the problem, the plywood industry is investing in research and development. The Parica Research Center, supported by the industry, has been established in Para state (Dom Eliseu City). This is a clear demonstration of the commitment of the Brazilian tropical plywood industry to forest development in the tropics.

Teakwood as a potential species for veneer and other products

Teak is another species that has attracted the attention of the plywood industry in Brazil in the last few years. Contrary to the history of teak in Asia, which dates back thousands of years, this species was introduced to Brazil less than 80 years ago. However, due to experiences gained from the early teak plantations and its

good adaptability to the Brazilian climate and soil, the area of teak plantation in Brazil is now increasing at a very rapid pace.

The first teak plantations were established during the 1960s in the State of Mato Grosso. These used seeds imported from, Trinidad and Tobago, a former British colony. Trinidad and Tobago teak plantations were established between 1850 and 1920 using Tenaserim, Myanmar (formerly Burma) teak seeds.

Brazil has invested heavily in forest plantations, introducing this new activity to private landowners, companies and investors. The total planted teak area in Brazil, for instance, is now around 50,000 hectares, making the country's teak plantations the largest in Latin America. It is worth mentioning that most of Brazil's teak forests were planted within the last ten years, so most are still not producing logs for the market.

Plantation teakwood has a light golden color and a density of around 600 kg/m³. It is a very stable wood, and trees produce adequate logs for veneer production in 20–25 years. Sliced veneer from plantations has a good decorative effect and is appreciated by the plywood and furniture industry.

Teak plantations in Brazil are favoured by the availability of extensive areas of private owned land, with adequate soils and climate. The existing monsoon-type climate, with annual average temperatures of 22–27°C, an annual precipitation of 1,500–2,500 mm and defined dry seasons (from May to June and October to November), creates the necessary conditions for high-yield and good wood-quality teak plantations.

Floresteca Agroflorestal Ltda, our company, owns the largest teak plantations in Brazil. A Dutch/Brazilian company created in 1994, it has already established around 20,000 hectares of teak plantation in Mato Grosso state (see Map 1 for the location).

Floresteca plans to expand its teak plantations to 50,000 hectares in the next ten years and to become the single-largest private teak plantation in that part of the world. The existing plantations were certified in 1997 under the FSC criteria and indicators. This reflects the social and ecological responsibility of the company.

Thinking of the future, Floresteca is investing to improve productivity and ensure markets for future production. Among the investments made are those related to genetic improvement, alternative options for forest management, optimizing harvesting and transportation, and improving the utilization of teak timber in the local market.

Map 1. Location of Floresteca teak plantation

Floresteca aims to process in-country most of the timber produced in its plantations. To reach this target the company is working in close cooperation with the local timber industry to further develop plantation teakwood products.

The tropical plywood industry is involved in this task. For the moment the main target product is sliced veneer for the plywood and furniture industries, but laminated and engineered teak flooring are also promising products.

Final remarks

There is no doubt that the tropical plywood industry in Brazil will gradually divert from natural forest supply to plantations. The good results with plantations, lower operational costs and fewer environment pressures are among the reasons to change the supply source.

There are already good experiences with plywood production using timber from tropical forest plantations. Fast growth and short rotation cycles are essential to reducing costs. Nevertheless, there are other risks associated with plantations, and investment in research is fundamental to ensuring sustainability.

Certification is playing an important role in tropical wood plantations that will increase when demanding markets such as Europe and the US consider it essential. Apart from the market, certification provides trackable wood and social and environmental care within forest management, which is crucial for sustainable growth.

The plywood industry in Brazil has learned that investing in plantations and forest management is only one side of the business. Investments are also required in industrial technology and equipment. Producing plywood using juvenile wood and small-diameter logs is quite different from working with natural-forest logs.

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The raw material supply for tropical timber: a global outlook

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In the last decade, around 15 global wood-supply studies have been carried out by international organizations, academia and consultant companies. Most concluded that while the total wood harvest has increased over time, the supply of industrial roundwood will be sufficient to meet demand by 2050 (FAO 2005), mainly because of the prominent role of planted forests. A different view was presented by Nilsson (1996), who argued that if all the demands on the services of forest ecosystems are going to be fulfilled, this will result in substantial competition for forest resources. A tropical wood-supply analysis of the tropical plywood industry presented at the last ITTO global conference on tropical plywood in 1991 concluded that there will be no great limitations on the supply of suitable raw materials for this industry sector, with the exception of logs for high-quality decorative veneers (ITTO 1991). Again, planted forests were nominated for a major role in maintaining production levels.

This paper describes some of the most relevant global issues related to wood supply for the tropical plywood industry and proposes possible actions aimed at supporting the development of useful planning tools in this field.

Forest resources

Using the global definition of the FAO Forest Resources Assessment 2000, it was estimated that the world's forest cover in 2000 was about 3.9 billion hectares, of which 95% was natural forest and 5% was forest plantations. The net global change in forest area between 1990 and 2000 was estimated as -9.4 million hectares per year, or a loss of 94 million hectares in the decade. Major forest area losses were reported for the tropics, with an annual gross deforestation area of 14.2 million hectares and an average gross 1.9 million-hectare gain in forest cover, resulting in a net loss of 12.3 million hectares (FAO 2001; Table 44).

Table 44. Annual gross and net changes in forest area, 1990–2000 (million hectares/yr)

Domain	Deforestation	Increase in forest area	Net change in forest area
Tropics	-14.2	+1.9	-12.3
Non-tropics	-0.4	+3.3	+2.9
World	-14.6	+5.2	-9.4

Source: FAO 2001

The reported losses of tropical forest in recent decades has negatively affected the forest products industry and in particular the tropical plywood industry. Although the negative trend in tropical plywood production, mostly in the case of Indonesia, is not only due to the constant decrease of good-quality veneer logs, raw-material supply remains one of the major factors influencing the negative performance of the tropical industry and the lower competitiveness of tropical plywood as a commodity in global markets.

The main sources of tropical wood are concentrated in the Amazon, West and Central Africa, Southeast Asia and the Pacific sub-regions (Table 45).

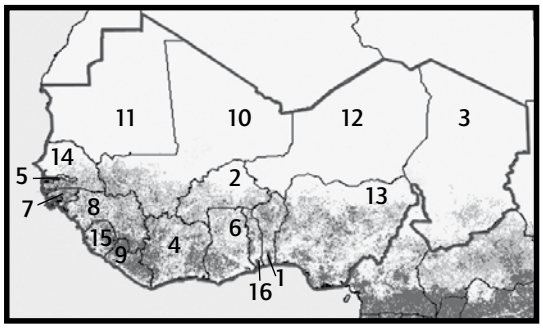
Of the four presented sub-regions, West Africa (Map 2) reports the smallest forest area in both

Table 45. Forest resources in the main tropical sub-regions

Region	Land area ('000 hectares)	Natural forest ('000 hectares)	Forest plantation ('000 hectares)	Total forest ('000 hectares)	Area change 1990–2000 ('000 hectares/yr)	Volume (m^3/hectare)
West Africa	733,359	83,369	1,710	85,079	-1,351	61
Central Africa	403,298	227,377	634	228,011	-852	127
Southeast Asia	436,022	191,942	115,847	211,914	-2,329	64
Tropical South America	1,387,493	827,252	6,890	834,142	-3,456	129

Source: FAO 2001

Map 2. West Africa



1. Benin
2. Burikina Faso
3. Chad
4. Côte d'Ivoire
5. Gambia
6. Ghana
7. Guinea Bissau
8. Guinea
9. Liberia
10. Mali
11. Mauitania
12. Niger
13. Nigeria
14. Senegal
15. Sierra Leone
16. Togo

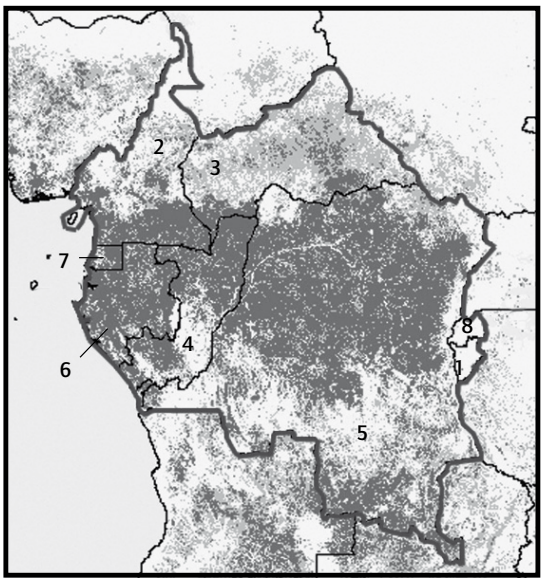
Source: FAO 2001

relative and absolute terms, with only 11% of the total land area covered by forest. The region also has the highest rate of forest area change – -1.5% on average during 1990–2000. Nigeria and Côte d'Ivoire had the greatest net annual loss of forest cover.

In contrast, the Central African forests represent the second-largest area of rainforest in the world and constitute 35% of the African forest area. The Democratic Republic of the Congo contains more than 60% of the sub-region's forest area. Gabon is the most forested country, with 85% of its total land area covered by forests. Despite the lack of accurate statistics, it is clear that the forests of the Congo Basin have experienced relatively low annual rates of clearing compared to other tropical forests and the whole of Africa. Given their quantity and quality, the available forest resources represent considerable potential. In fact, the total volume of Central African forests accounts for more than 60% of the total African volume. Central African forest volume is estimated to be 47 billion m^3 over bark, which corresponds to an average 127 m^3 per hectare (FA0 2001).

All of the Central African countries have adopted strategies and forest action plans that take into consideration their specific needs. Forest management for industrial wood harvesting is focused on the demarcation of concession areas. Medium- to long-term concession agreements are awarded to companies or individuals, often involving uncertainties, depending on the political situation of countries. Recent policies have been introduced in some countries. in Gabon, for example,

Map 3. Central Africa

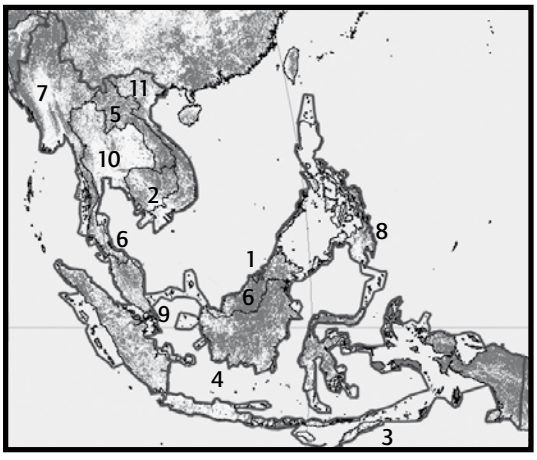


1. Burundi
2. Cameroon
3. Central African Republic
4. Congo
5. Democratic Republic of the Congo
6. Gabon
7. Equatorial
8. Rwanda

Source: FAO 2001

a resource inventory and a forest management plan proposal are compulsory before any harvesting. In the Congo and Cameroon, the national forest estate has been divided into FMUs under coordinated resource use and management units, causing great concern to wood harvesting and processing companies.

Map 4. Southeast Asia



1. Brunei Darussalam
2. Cambodia
3. East Timor
4. Indonesia
5. Lao's People's Democratic Republic
6. Malaysia
7. Myanmar
8. Philippines
9. Singapore
10. Thailand
11. Viet Nam

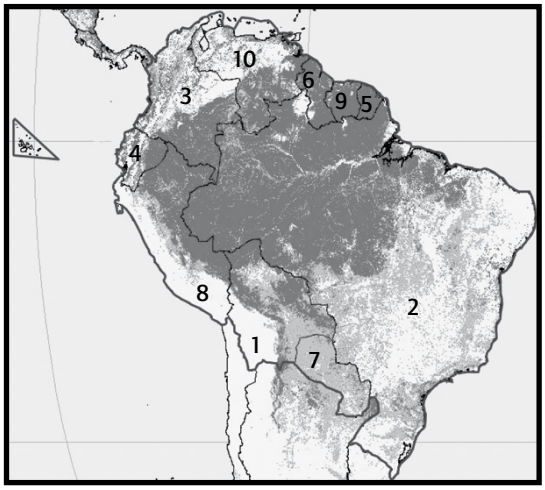
Source: FAO 2001

In Southeast Asia, forest resources have been adversely affected in the last decades. The total annual reduction of forest cover is greatest in Indonesia and Myanmar. Recent information on Indonesia indicates an annual loss of 1.8 million hectares per year (Indonesia FLB 2001). Some of the driving forces for losses in forest cover are the rapid economic growth of the Asian region, a fast-growing population and often weakness in the enforcement of forest regulations. The ability of natural forests to meet domestic and industrial wood and fuelwood requirements is continually declining. Uncontrolled access to and excessive use of forest resources in many places is leading to forest degradation, fragmentation and deforestation. Efforts are being made throughout the sub-region to meet the growing wood demand by increasing the area of industrial planted forests and trees outside forests to partly offset reductions in wood supply.

For many years, Southeast Asia has been the major supplier of tropical wood. Because accessible natural forests have mostly been over-harvested and industrial development for value-added production is taking place in the major supplier countries, the sub-region has been constantly decreasing the export of industrial roundwood.

The tropical South American sub-region possesses the greatest area of tropical rainforest in the world, with approximately 885 million hectares in the Amazon Basin and another 85 million hectares in the Orinoco and Paraná watershed complex. Forest resources have experienced serious deforestation and degradation during the last 4–5 decades. Between 1990 and 2000, the relative forest area change was -0.4%. Wood volume per hectare is high compared to other forest regions, but the commercial volume of commonly traded species is, in general, less than 10% of total volume, which averages about 120 m³ per hectare. Although legislation in all countries in the sub-region obliges forest owners or concessionaires to develop and implement management plans, forest administrations often do not have enough resources to control and monitor forest operations.

Map 5. Tropical South America



1. Bolivia
2. Brazil
3. Colombia
4. Ecuador
5. French Guiana
6. Guyana
7. Paraguay
8. Peru
9. Suriname
10. Venezuela

Source: FAO 2001

The management of tropical rainforests has always been considered an extremely difficult task, owing to the complex ecological ecosystems of the tropics and the often weak institutional infrastructure of the forest administration.

The current trend in the three regions can be illustrated at a country level by comparing the change in forest cover of two of the main tropical log producers for the plywood industry in Asia, Africa and Latin America. Countries like Ghana, Malaysia, Indonesia and Ecuador report the highest relative losses in forest

Table 46. Forest resources in six selected tropical countries, 2000

Country	Land area ('000 hectares)	Natural forest ('000 hectares)	Forest plantation ('000 hectares)	Total forest ('000 hectares)	Area change 1990–2000 ('000 hectares)/yr	Volume (m^3/hectare)
Brazil	845,651	538,924	4,982	543,905	-2,309	131
Ecuador	27,684	10,390	167	10,557	-137	121
Gabon	25,767	21,790	36	21,826	-10	128
Ghana	22,754	6,259	76	6,335	-120	49
Indonesia	181,157	95,116	9,871	104,986	-1,312	79
Malaysia	32,855	17,543	1,750	19,292	-237	119

Source: FAO 2001

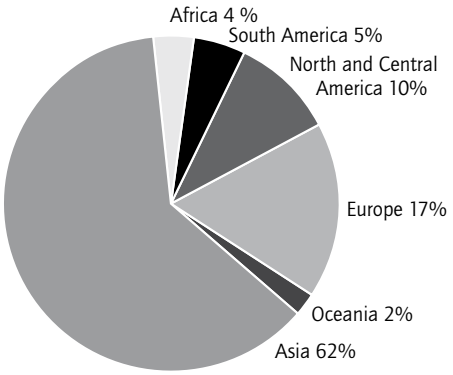
cover, in the range of 1.2% every year during the period 1990–2000, followed by Brazil. The losses in Gabon were negligible.

Although the reported yearly rate of forest cover change in Brazil of 0.4% was relatively low over the decade, in April 2004 the Brazilian government reported that nearly 230,000 km² of Amazon forests were cleared between mid 2002 and early 2004 – in particular in the state of Matto Grosso – for the expansion of agriculture and cattle ranching.

Planted forest resources

In contrast to the high losses of the world's natural forests at the global level, new forest plantation areas were established in the last decade at the reported rate of 4.5 million hectares per year, with Asia and South America accounting for the largest share of the total estimated plantation estate of 187 million hectares. Industrial plantations accounted for 48% of the global forest plantation estate, and their importance in wood supply for the plywood industry is increasing, particularly for subtropical and temperate hardwood and softwood planted forests.

Figure 109. Distribution of forest plantations by region



Source: FAO 2001

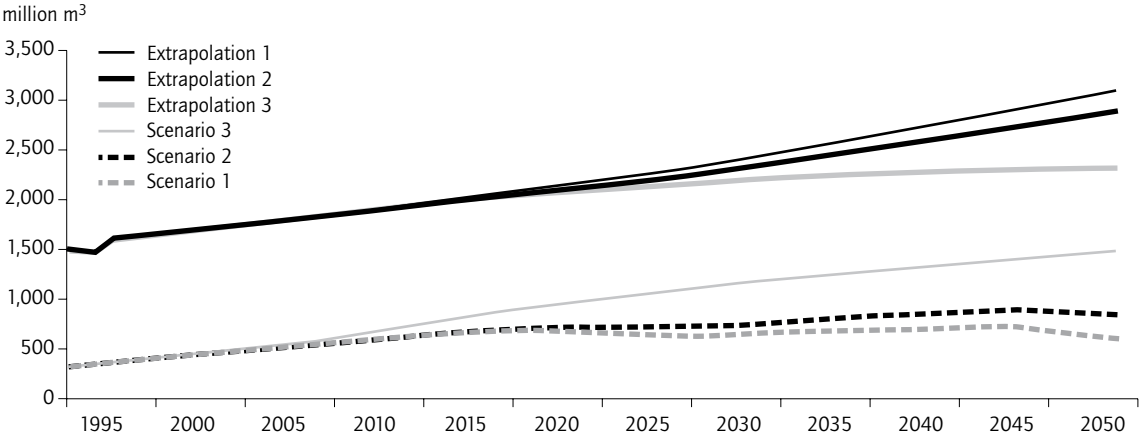
While plantations accounted for 5% of the total forest area in 2000, it is estimated that they contributed approximately 35% of the global roundwood supply. In the Global Outlook for Future Wood Supply from Forest Plantations (FAO 2000), Chris Brown developed a model that estimated the volume of roundwood that could be produced from the world's forest plantations based on their area, species, type, yield and age structure. He developed three alternative forest plantation establishment scenarios (Figure 110):

1) no new forest plantation establishment, but replanting all existing areas after harvesting;
2) new planting at a fixed annual rate equal to 1% of the current forest plantation area (plus replanting of all existing areas after harvesting); and
3) new planting at the estimated current rate of new planting for ten years, with this rate reduced by 20 percentage points at ten-yearly intervals (plus replanting of all existing areas after harvesting).

Brown compared the three extrapolations of future industrial roundwood consumption with the different projected levels of future potential industrial roundwood production from industrial forest plantations under each of the three scenarios for future forest plantation development. He concluded that, by the year 2050, the consumption of wood from plantation forests could be 30–64% of total wood consumption.

The remarkable development of planted forests has so far provided modest relief to the global supply of veneer-quality tropical logs for plywood production, since most of the planted trees are not tropical native species but mainly fast-growing tropical pine, acacia or *Eucalyptus*. Wood from planted forests is increasingly becoming a substitute raw material for tropical plywood

Figure 110. Industrial roundwood consumption and potential production from forest plantations



Source: FAO (2000)

Table 47. Natural forest area by region ('000 hectares)

Region	Total	Not available for wood supply	Available for wood supply	Undisturbed	Disturbed
Africa (26)*	399,618	233,157	166,461	59,469	106,992
Asia (22)	408,605	177,338	231,267	48,729	182,538
South America (13)	869,097	709,105	159,992	34,850	125,142

**The number of assessed countries are in brackets*
Source: FAO Global Fibre Supply Model 1998

Table 48. Average standardized forest volume by region (m^3/hectare)

	Growing stock		Commercial species growing stock	
Region	Undisturbed	Disturbed	Undisturbed	Disturbed
Africa (26)*	227	124	105	53
Asia (22)	151	84	62	65
South America (13)	158	116	70	48

**The number of assessed countries are in brackets*
Source: FAO Global Fibre Supply Model 1998

production. The benefit of efforts to secure raw material supply will continue to be in the use of fast-growing planted trees used for the production of combi-ply with plantation wood for the core and tropical wood from natural forest for the faces.

Tropical wood supply

The trend described by Maloney (1989) of a decreasing supply of wood for producing plywood and lumber products is today a reality for many of the well-developed forest products' industry regions and in particular for tropical-timber supplying countries. For the last few decades the tropical forest industry sector has been facing a constant decline in good-quality and affordable raw material from natural forests.

Most of the accessible forest areas available for wood supply in the tropics have gone through the first rotation period, often with harvesting intensities higher that the MAI. The Global Fibre Supply Model (GFSM; FAO 1998) analysed the raw material available for industrial purposes at a global level and produced a series of possible future scenarios by applying a simple model which took into account forest resource data, economic or legal accessibility, and the impacts of SFM, technology development and trade. Many of the conclusions and trends drawn in the GFSM are still valid. According to the then-used forest terms and definitions, the GFSM reported on total area of natural forest available and not available for industrial wood supply, and identified the areas disturbed (that is, logged-over forests associated with various intensities of logging) and undisturbed by man.

For example, the wood cost and volume impact of the introduction of SFM in natural tropical forest was analyzed based on field case studies. The case studies showed that costs could be expected to rise between 5 and 25% and that there would be reductions in harvest volume, particularly in the short term. It was expected, however, that, in the long-term, supply will increase through the application of SFM.

Although the statistics shown in the GFSM are relatively old, the figures illustrate the situation of more than a decade ago, a situation still valid today. It also demonstrates the difficulties of tropical wood availability for plywood production.

The ratio shown in Table 47 between forest available and not available for wood supply as well as the ratio between forest disturbed and undisturbed by man reflect the scarcity of natural forest area available for tropical wood, particularly in Asia and also in South America. Of the total forest area considered by the GFSM to be available for wood supply, only 25% was forest undisturbed by man. This is also reflected in the growing stock volumes (Table 48).

Table 49 presents the total potential volume growth and harvesting intensity of commercial and all species, by region. In general, disturbed forest has a lower average harvestable volume, particularly in Africa and South America, where harvesting in the past may not have been appropriate from a silvicultural point of view.

*Table 49. Potential volume growth and harvesting intensity by region**

Region	Gross annual increment				Harvesting intensity	
	000,000 m³		Average (m³/hectare)		Cutting cycle (m³/hectare)	
	All species	Commercial species	All species	Commercial species	Undisturbed forest	Disturbed forest
Africa (26)**	146.3	56.9	1.4	0.5	11.5	4.4
Asia (22)	328.3	273.7	1.8	0.5	33.9	17.3
South America (13)	473.1	147.7	3.7	1.1	18.0	11.2

**Volumes pertain to the forest available for wood supply*

***The number of assessed countries are in brackets*

Source: FAO Global Fibre Supply Model 1998

The table indicates that the total annual growth in the regions is 947.7 million m³ in the forests available for wood supply, of which 478.3 million m³ are potentially commercial. Historical management practices in these regions indicate a significantly lower harvesting intensity once the forest is disturbed compared to boreal regions. The critical factor is the type of silvicultural or harvesting system chosen for management purposes.

The high harvesting intensity in Southeast Asia compared to the other regions is well known, considering the 30–40 m³ per hectare harvest recorded in the dipterocarp forests there.

Trends in wood supply

The negative trend of tropical wood availability is not only linked to the reduction of stock volumes caused by deforestation and forest degradation but is also affected by other factors such as pressure from environmental groups, the increased setting aside of forests in totally protected areas, more complex policies and regulatory frameworks, higher harvesting and extraction costs, and accessibility of the resource. As a result, the operational costs of tropical plywood producers have increased over time, with less availability of large-diameter logs, lower quality, longer distances to the mill, and higher requirements in terms of human resources and equipment for the development and implementation of management plans, forcing industries to rapidly adapt or in some cases discontinue operations.

A brief overview of some of the trends affecting the supply of tropical veneer logs will illustrate the difficulties faced by the plywood industry in managing and securing the necessary raw materials. It is important to note that the greatest difficulties are faced by tropical plywood-producing countries relying on imported logs.

Restrictions in log exports

With some exceptions, tropical countries have introduced restrictions on the export of industrial roundwood. In Cameroon, in accordance with Law 34/01 of 1994, all logging companies are allowed to export 30% of logs within the first five years following company establishment. Thereafter, all logs are to be processed locally (ITTO 2004a). In the Central African Republic, the 2000 Budget Act allows a log export quota for every operator equivalent to that operator's export volume of sawn timber. In Gabon, the export duty on tropical logs has been increased from 15 to 20% and in PNG the export duty on logs goes up to 70% (ITTO 2004a). The United Nations imposed sanctions in Liberia on log exports. Log export bans are also in force in Brazil, Côte d'Ivoire and Cambodia.

Over-harvesting

In many tropical countries, natural forests have been substantially over-harvested. Among other things, this assists the conversion of forest land to agriculture. In addition, populations are expected to grow most in developing tropical countries, leading to more pressure on forest land.

Of China's major tropical log suppliers, PNG is expected to have fully allocated its forestlands within 3–6 years and to have essentially exhausted its available natural forest resources for wood supply within ten years if harvesting continues at current rates (Katsigris et al. 2004). In the case of Myanmar, border areas responsible for supplying timber to China are reported to have 10–15 years of economically accessible resource remaining.

Value-added products

Recent national policies encourage the development of value-added products' manufacturing in tropical countries and are causing local competition for raw material, in addition to the continuous decline of wood supply. This is certainly a positive trend for the forestry sector in general but forces less-flexible large plywood mills to pay higher prices for their raw material and even to consider importing supplies of non-tropical species to match their log requirements.

Gabon, for example, is also encouraging forest products' companies to add value to harvested logs locally. It has therefore recently increased the export duty on tropical logs from 15 to 20%, and a quota has been fixed for each operator by Gabon's National Timber Company for the production of okoume (*Aucouomea klaineana*) timber (ITTO 2004b).

Changes in supply flows

Most plywood mills in Indonesia have their own concessions or estates. As a result of a 1985 law, companies are required to set up processing mills in order to retain their timber concessions. While this allows mills to produce a significant part of their raw-material requirements from their own concessions, they face growing difficulties in maintaining log supplies. Some plywood manufacturers had to cease or reduce operations due to a shortage of logs (ITTO 2004a). In Malaysia, the availability of logs from clear-cutting (during land conversion) or from the permanent forest estate is declining. Even mills with access to their own concessions purchase a large part of their log supply on the open market. Unlike Indonesia, Malaysia allows the export of logs, so domestic prices are linked to international prices.

Illegal logging

In many cases, increasing trade flows of tropical wood and wood products are associated with illegal logging, corruption and a lack of livelihood opportunities for forest-dependent communities. The World Bank (2002) estimates that illegal logging costs around U$15 billion globally every year. Illegal logging not only distorts global markets, it discourages responsible companies in their efforts to improve forest management practices and, in the log term, reduces the availability of wood resources.

Pressure from the international community and domestic environmental NGOs has forced countries to improve law enforcement or introduce new laws to combat illegal activities in the forestry sector. For example, in efforts to decrease illegal log trade through the Indo-Malay borders, Indonesia and Malaysia decided in December 2004 to carry out 'government-to-government' timber trade, where only logs received through government-designated ports would be considered legal. Indonesia also signed bilateral trade agreements with several importing countries in an additional effort to reduce illegal logging.

Environmental pressure

Increasing public awareness of the necessity to protect natural resources and to conserve biodiversity in forested areas is contributing to the establishment of laws and regulations aimed at protecting the environment. In many tropical countries, this has already translated into restrictions in forest harvesting activities and has reduced wood supply volumes. This is a long-term trend in some tropical countries, where management plans are to be developed to allow longer periods between harvesting and setting aside larger forest areas for protection. It is generally accepted that environmental constraints for traditional wood supply will continue in future (Nilsson et al. 2005).

Pressures from environmental groups are aimed at influencing national policies that consider the forest industry sector as a driving engine for sustainable development. For example, with the support of the World Bank and FAO, the Democratic Republic of the Congo is working towards increasing industrial logging to promote economic development and to establish a new set of forestry laws to implement the new Forestry Code. This includes the development of zoning plans covering approximately 1.3 million square kilometres aimed at identifying logging, conservation and community areas. A number of NGOs have opposed this initiative.

An increased number of retailers in industrialized countries are demanding that wood products are sourced from certified forests. The process of achieving the certification of tropical forests requires a high initial investment, often involving expensive activities that are the obligation of governments but must be carried out by private enterprises.

Conclusions

The decline of available raw material for tropical plywood production at affordable prices is a reality in most regions in the world, particularly in Southeast Asia and many African and South American countries. This trend has negatively affected the performance of the traditional tropical plywood-producing countries, especially Indonesia, Malaysia and Brazil. The installed mill capacities need to secure raw material flows at reasonable market prices for long-term operations, recognizing the competition with other emerging wood manufacturing sectors.

Many governments are in the process of introducing or strengthening their policies on SFM. In the long term, the expected impacts should help better determine constant supply volumes, which in turn should assist the better planning of tropical plywood production and marketing. Until then, plywood manufacturers need to continue their efforts to optimize the use of the available wood resources by increasing recovery rates, using or developing alternative wood resources such as planted forests, and adding more value to their products.

The international community should continue its support to governments in improving the knowledge base on forest resources, including information on the area of forest available for wood supply and related parameters such as species suitable for veneer production. This would include capacity-building programs geared to carry out efficient and cost-effective forest resource assessment and monitoring. ITTO and FAO, together with other partners, are committed to contributing to the needs of their member nations in this regard.

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Session V: Improving Corporate Responsibilities

Corporate social responsibility*

Andy Roby
Timber Trade Federation, UK

Good Wood means Good Business:
CSR and Tropical Plywood
The UK Timber Trade

The UK timber trade is very old and still very fragmented. It is the fourth-biggest net importer of timber in the world and its 2003 timber consumption was 17.5 million m^3. The UK has buying power because 71% of UK timber is imported, of which 6.5% (800,000 m^3) is tropical. The Timber Trade Federation (TTF) has 160 members, of which 40% has a turnover of less than £20 million per annum.

Corporate responsibilities theory – managing risk

CSR developed as a discipline as a result of the way issues have been managed, for example:

- Nestle infant formula
- Barclay's and South Africa
- Shell and Brent Spar

Sales and profitability are affected and 'head in the sand' is no longer an option:

- investors are more active
- markets are affected
- governments start to regulate more

There are some big CSR issues in the tropical plywood industry.

What is CSR?

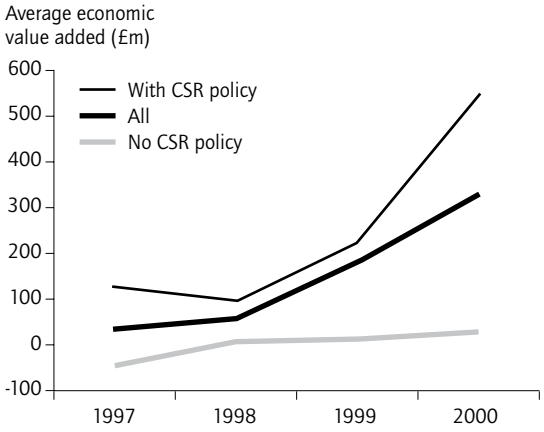
"CSR is the commitment of business to contribute to sustainable economic development, working with employees, their families, the local community and society at large to improve their quality of life." World Business Council for Sustainable Development

A positive impact on society. It also has to be good for business.

CSR benefits

- Improved financial performance
- Enhanced brand image and reputation
- Increased sales and customer loyalty
- Reduced operating costs
- Increased productivity and quality
- Increased ability to attract and retain employees
- Reduced regulatory oversight
- Access to capital

Figure 111. Economic value added (yearly average for major UK companies)



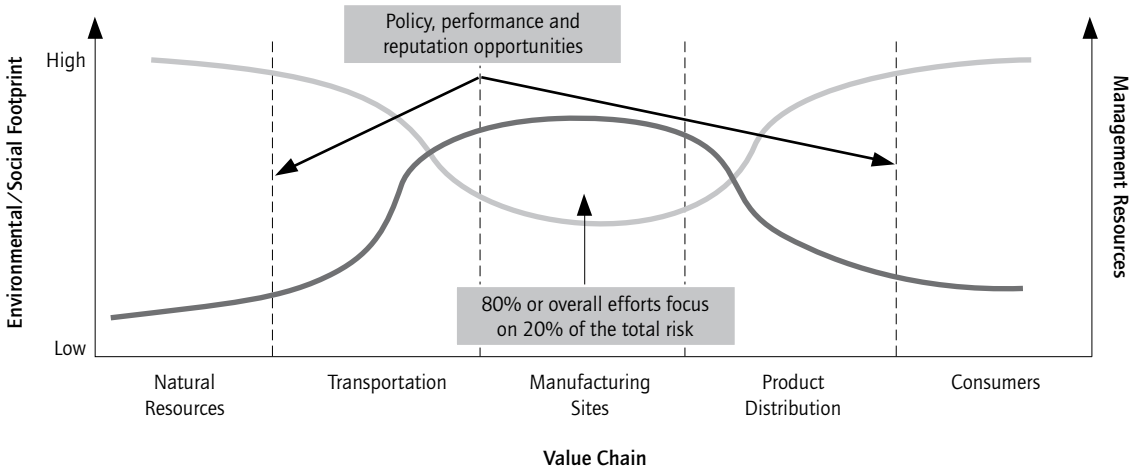
CSR in the forest industry

Twenty-nine forest-product companies were assessed and ranked against environmental performance.

- 'Good' outperformed 'bad' share value by 43% over four years
- 'Good' also outperformed on:
  - operating profit margin
  - net profit margin
  - return on equity

** Text prepared by the editors based on a Powerpoint presentation given at the conference*

Figure 112. CSR: effort versus impact



Source: Steve Howard, ERM

- return on assets
- Price/earnings ratio, etc

"Strong evidence of financial merits of sustainability leadership to the value placed by the market on the shares of top performing firms" – Innovest Strategic Value Advisers, June 2003

Do your stakeholders matter?

WTO Summit in Seattle:

- Value of Fortune 500 companies with a reputation for social responsibility declined by just 1%
- Those without such a reputation declined by 2.6%

At Sears:

- 5% increase in staff satisfaction
- led to a 2% increase in customer satisfaction
- Which in turn led to a 0.5% increase in store revenue

Does price and technical quality matter so much nowadays?

- eg designer clothes, fair trade coffee, etc
- It is happening in the timber trade

CSR study findings

The timber industry is lagging behind other sectors, notably 'competitors' such as brick and block.

- Too risky for socially responsible investors
- Some companies have CSR policies and some management systems but there is still a 'missing middle'
- Our corporate customers are adopting CSR policies and expecting alignment from their suppliers

The main CSR issue is: where does our timber come from?

A tale from the timber trade (Part 1)

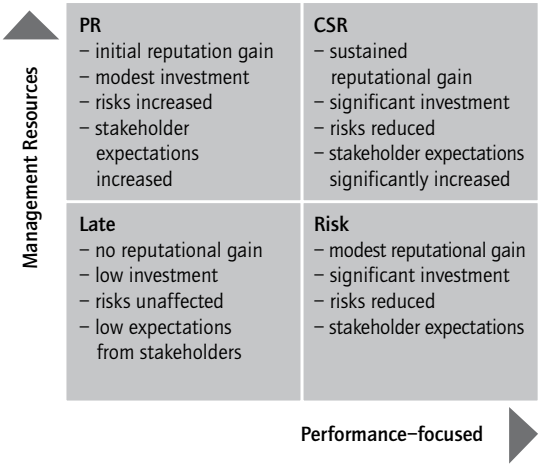
A TTF member wants to change banks. Old family firm, tropical plywood trader, long history, active supporters of the Federation, but 'conservative'. Everything goes well until the HSBC manager notices that his new customer trades in timber:

- HSBC: "Where does your timber come from?"
- Timber trader (falling off seat): "A Southeast Asian country."
- HSBC: "Here is the HSBC policy on forests – can you subscribe?"
- Timber trader: "Don't be silly – there is no certified timber from my supplier's country."
- HSBC: "We cannot proceed with your application, sir."
- Timber trader: "What can I do?"
- TTF: "Sign up to the Responsible Purchasing Policy (RPP) and get your mill in Southeast Asia to work with the Tropical Forest Trust towards credible certification and join the Timber Trade Action Plan."

The TTF member is now an RPP signatory and is actively working with his Southeast Asian supplier to get certified timber.

CSR – the practice: where does your company fit?

Figure 113. The CSR diagnostic



How to go about it – the CSR diagnostic

The CSR diagnostic is a short exercise to help a company take a first look at where they are now and where they might wish to go within two years. It provides a basis for comparison – a quick 'diagnostic'. It is not a definitive picture, but a useful working hypothesis of where a company might focus.

Corporate issues – governance

Where are we? (see Table 50)

1) We have a board that looks at risk, but no one on it is nominated for CSR issues
2) We have a board member who is responsible for CSR issues and signs the policies
3) We have a board member who is responsible for CSR issues and signs the policies and who sits on the environmental and health and safety committees
4) We have a board member who has a real interest in CSR issues and is always involved in discussions about environmental and social risks. The whole board regularly reviews the reports from our social, environmental and health and safety committees
5) A board member is assigned responsibility for ensuring all environmental and social risks associated with the business are identified and we have built up management systems to ensure that these are addressed. All significant issues are dealt with by the board and included in our annual report

Table 50. CSR: where are we and where do we want to be?

	1	2	3	4	5
Corporate Issues					
Governance	♦	✕	O		
Risk		♦	O		
Policy		♦	O		
Timber policy		♦	O		
Business operations					
Management systems		♦	O		
Information systems		♦	O		
Supplier relationships		♦	O		
Supplier sourcing		♦	O		
Products and services		♦	O		
Performance		♦	O		
Timber performance		♦	O		
External issues					
Issues monitoring		♦	O		
Stakeholder relations		♦	O		
Reporting/communication		♦	O		

The UK TTF case study

UK market drivers

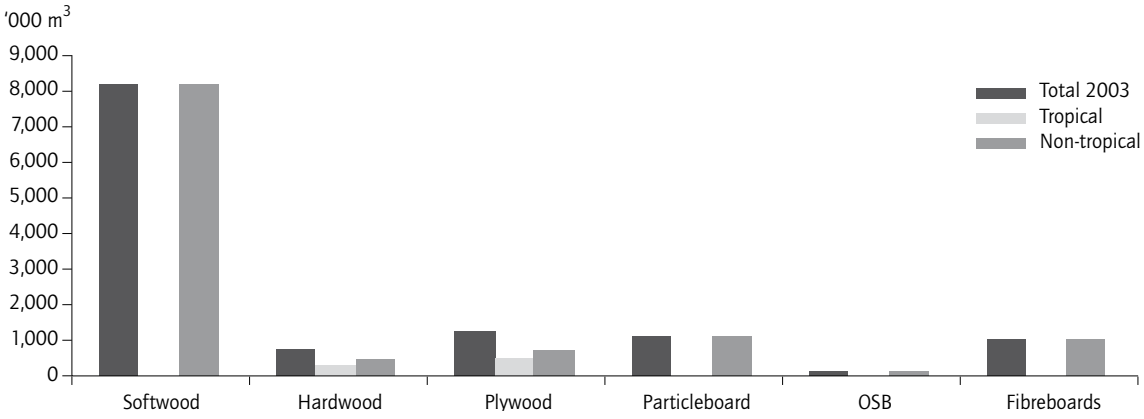
The UK government will only buy legal and sustainable timber. Big building companies (70% of timber consumption) are adopting the same policy. Shareholders are asking questions. Timber traders want to establish timber as the sustainable building material. UK and EU legislation and other policies:

- FLEGT
- CE Marking
- Anti-dumping
- CITES

How are we doing?

- Steady rise in consumption of timber
- 17.8 million m^3 in 2004
- Industry is adding more value to products
- Timber is more fashionable
- Designs are improving
- Timber is intrinsically "the most sustainable building product"

Figure 114. UK consumption of imported tropical/non-tropical timber and panels, 2003



- What our competitors say: "Save a tree, use PVC: As a tree, timber does symbolize environmental goodness. However, the processes necessary to make it a viable building material removes many of its assumed green credentials." – www.concretecentre.com

The EU Timber Trade Action Plan

This is a €7 million, five-year project to get verified legal timber with chain of custody from Indonesia, Malaysia, Cameroon, Congo-Brazzaville and Gabon. Core partners are the UK, Dutch, Belgium, French, Malaysian and Indonesian timber organizations and the Tropical Forest Trust is project manager.

– Results: audited timber from 183 mills and forests – steps towards sustainability

– Next steps: Latin America

Improving corporate responsibilities: the case of Indonesia

Njoto Suhardjojo, Member of the Board
APKINDO, Marketing Division, Indonesia

World tropical rainforests

Data obtained from the United Nations issued in 1993 which is still relevant today shows the countries with the most forest cover (Table 51).

Table 51. World forest cover

Ranking	Country	Forest area (million hectares)
1	Brazil	561.1
2	Zaire (Democratic Republic of the Congo)	113.2
3	Indonesia	109.5
4	Peru	67.9
5	Colombia	54.0
6	India	51.7
7	Bolivia	49.3
8	Venezuela	45.6
9	Malaysia	32.8

Indonesian forests

Indonesia's forests are among the most biodiverse, extensive and valuable in the world. The forest under Forestry Department jurisdiction covers approximately 70% of Indonesia's total land area, provides habitats for a wide range of flora and fauna and plays a pivotal role in economic development, the livelihoods of the rural poor and the provision of environmental services. Based on habitat factors such as soil, climate, altitude, topography, geology and rainfall, the tropical forests of Indonesia can be classified as follows:

1) coastal forest, 2) mangrove forest, 3) swamp forest, 4) peat swamp forest, 5) lowland forest, 6) sub-montane rainforest, 7) montane rainforest, 8) sub-montane and montane monsoon forest, etc.

Indonesian forests constitute 10% of the world's remaining tropical forests and 60% of all forests in Southeast Asia. As such, Indonesia carries a heavy responsibility for environmental issues and the implementation of SFM. Actually, sustainable-yield forest management in Indonesia began in 1898 when the colonial government initiated a teak plantation in central Java. In 1927, forestry law and regulations were promulgated for teak forests in Java and Madura, which were managed based on a silvicultural scheme using clear-cutting followed by plantation establishment.

Indonesian forestry laws & regulations

Introduction

Up to the second half of the 1960s, natural tropical forests in the outer islands of Indonesia were left untouched; they were jungles in the remote areas without any infrastructure or access and surrounded by less-populated regions. Our government started to explore the forest wealth for the welfare of the nation and issued Forestry Act No 5 in 1967, which contained provisions for forest management and basic forestry regulations that stipulated that forest management was to be conducted on a sustainable basis. This implied that all forestry programs should be guided by the goal of achieving sustainable use and conservation.

Log harvesting system

Concession-holders usually obtain the right of harvesting for 20–50 years on 35-year growth cycles. The concession is then divided into seven blocks, with each block designated for five years under working plans. Before setting the yearly working plan, a 100% census of the standing stock of trees in the cutting block is conducted, the trees to be cut are marked and a cruising report compiled. Forestry officials check and process the cruising report to determine the annual allowable cut based on the standing stock with a 0.7 factor x 0.8 safety factor.

The method of harvesting forest carried out since 1968 has been the silviculture selective cutting system, under which only trees with diameter 50 cm and up are harvested in production forest. The exception is 'limited production forest', in which trees with diameter 60 cm and up are allowed to be harvested.

Log-tracking system

After harvesting, the concessionaire prepares a log-cutting report, and the cut logs are delivered to a designated log-yard, which will be used as a 'dumping point' for the logs to be rafted on the river. Each designated log-yard makes a 'logs mutation report'.

Based on the log-cutting and mutation reports, an official of the Forestry Department issues a forest products' legality letter (In Indonesia it is known as SKSHH = Surat Keterangan Sah Hasil Hutan); logs accompanied by an SKSHH can be transported to the designated destination: ie directly to industry mills or sometimes to the log-ponds of a log trader. When the logs arrive at their destination, the receiver must report to the regional or municipal forestry officials and the SKSHH stamped for invalidation.

From 1968 to 1997, under the strict supervision of the Forestry Department, forest concession management units were harvested under a silviculture system known as the selective harvesting system. This system had been combined with timber plantation development commencing in the early 1990s.

The monetary crisis in mid 1997 had a large impact on the forestry sector in Indonesia. Indonesian forests have been increasingly threatened by the damaging activities of illegal logging, which became rampant and were accelerated by illegal trade and smuggling.

Improving corporate responsibilities

Government's commitments

In Bali in September 2001, at a conference on East Asia Pacific Forest Law Enforcement and Governance, the Indonesian government made a commitment to take immediate action to intensify national efforts to tackle illegal logging, strengthen bilateral, regional and multilateral collaboration on forest crime and share information on forest crimes with other countries.

At a multilateral level, Indonesia raises the awareness of ITTO member countries towards this issue. At a regional level, the establishment of the Asia Forest Partnership showed the collaborative efforts by both producer and consumer countries to combat illegal logging and its associated trade.

On 18 April 2002, an MOU to combat illegal logging and the internal trade of illegally logged timber and wood products was signed with the UK. On 18 December 2002, an MOU concerning cooperation in combating illegal trade of forest products was signed with China. On 24 June 2003, a joint announcement on cooperation in combating illegal logging and the trade in illegally logged timber and wood products was signed with the Government of Japan.

To demonstrate support for anti-illegal logging efforts, President Susilo Bambang Yudoyono, who was inaugurated in October 2004, included efforts to curb illegal logging in his 'First 100 days Plan' and targeted the ring-leaders behind organized forest crime in his 'Eight Steps Program' to eradicate corruption in Indonesia. On 18 March 2005, Presidential Instruction No 4 was issued, instructing 18 institutions to actively and seriously punish the actors of illegal logging in all parts of the country.

The Indonesian Ministry of Forestry has also stated a commitment to continue its fight against illegal logging by sharpening its five forest-sector priorities:

- combat illegal logging and the associated illegal timber trade;
- revitalize the forest industry;
- rehabilitate and conserve forest resources;
- economically empower people living in and around forest areas; and
- stabilize the area of forest land.

Efforts from industrial sectors

Realizing the declining supply of raw material, most wood industries have switched to lesser-known species and are also absorbing more timber from industrial timber plantations and non-forest timber (timber from community forests, timber from conversion areas and timber from agricultural estates). It is also essential to improve production efficiency by introducing better technology, encouraging plywood mills to use rotary lathes with small spindles or spindle-less rotary for higher recovery rates, maintaining the market by producing only quality products.

The existence of BRIK (Forestry Industry Revitalization Body or Agency for Revitalization of the Forest Industry): to strengthen the control of the SKSHH, joint decrees were issued by the Minister of Forestry and Minister of Trade and Industry, setting up BRIK on 13 December 2002. The scope of work of BRIK is to assist in bringing about SFM to maintain a sustainable supply of logs to the wood industries and create jobs and opportunities for doing business. The desired target has been to balance the capacity of production with the supply of raw material, enforcing all wood industries to use only logs or timber that have documents of legality. By the decree of the Minister of Industry and Trade, the export of wood panels and mouldings have to be endorsed by BRIK, effective from 15 March 2003. Therefore, any wood products which have got BRIK's endorsement are derived from legally harvested logs.

Brief report on the production and market of plywood in Côte d'Ivoire

M. Birkenmaier, President
SPIB

Côte d'Ivoire, a republic of West Africa, is located along the Gulf of Guinea. It covers a total area of 322,463 km and has a population of 16 million people which is growing at 3.59% per year. The state's economy is based on agriculture, which represents 38% of the GDP. This accounts for 66% of the export revenue and occupies two-thirds of the national workforce.

The forestry sector yielded 37.2 billion Central African francs over a period of ten years (€56.7 million, or US$69.2 million) and contributed 5.6% of tax revenues in the 1990s.

In the forestry sector, Côte d'Ivoire has two large spheres of activity. The country's permanent forest estate, estimated at 6.196 million hectares, consists of 229 classified forests covering a total of 4.196 million hectares of different types of natural forests, 168,000 hectares of forest plantations, and 2 million hectares of protected areas and reserves.

The rural area covers 11.4 million hectares, consisting of an assortment of agriculture, fallow land, settlements and water bodies, including 4.9 million hectares of residual forests and 50,000 hectares of forest plantations (Table 52).

Table 52. A brief view of the national forest estate

National forest estate (million hectares)	
Permanent forest estate	**Rural area**
• 229 classified forests forest plantations (4.2)	• crop fallows and rural settlements (6.5)
• 11 national reserves (2)	• residual forest fallows, forest plantations (4.9)

Challenges and production and consumption perspectives of Ivorian plywood

Côte d'Ivoire has 80 wood-processing factories, of which 13 are integrated plywood industries, distributed throughout the country (Table 53). The wood industry supports 25,000 direct jobs and almost 15,000 indirect jobs.

Table 53. Plywood industries in Côte d'Ivoire

No.	Name	Location	Production (m^3)		Comments
			2004	% of total	
1	INPROBOIS	Adzopé	13,976.06	21.3	
2	Holz Ivoire/ SITRANSBOIS	Abengourou	16,757.71	25.5	
3	SCAF	Grand-Bassam	18,314.77	27.9	
4	African Industry	San-Pédro	771.33	1.18	
5	CIBB/ADK	Soubré (Buyo)	–	–	Halted in 2004 and resumed during 2004
6	SIP Catala	San-Pédro	5,136.90	7.83	
7	SOGICI	Abidjan (ZI. YOP)	587.39	0.90	
8	AMCOBUS	Abidjan (ZI. YOP)	232.81	0.35	
9	AFRICAN WOOD	San-Pédro	–	–	
10	CIB	Gagnoa	5,619.00	8.56	
11	IFEX-CI	Bouaké	–	–	Halted in 2004 and resumed in 2005
12	BTA	Guiglo (Zagné)	–	–	
13	ESDI	Divo	4,220.82	6.43	
TOTAL			**65,616.79**	**100**	

Table 55. Distribution (in % of volume) of the Ivorian plywood market, 2004

Proportion of domestic market (%)	Proportion of export market (%)	Distribution of export market (%)	Continents involved	Some consumer countries (indicative)
41	59	42	Africa	Senegal, Morocco, Benin, Gambia, Burkina Faso, Mali, Mauritania, ...
		57	Europe	Germany, Ireland, United Kingdom, France, Poland, Turkey
		1	Asia	Qatar, Dubai, India
		Traces	United States	New York, Baltimore

Although plywood was produced in Côte d'Ivoire before the 1990s, it did not become important until 1990. Beforehand, production was negligible and sometimes interrupted.

According to Table 54, the average annual production of plywood over the last ten years has been around 60,175 m^3 and has only had a really sustained expansion beginning in 1995, probably as a result of the forestry reform. This expansion is because of three motivations:

- plywood is indispensable to the wood market;
- the production of plywood helps the profitability of the veneer peeling and slicing trims and thereby contributes to increasing output; and
- these two motivations are taken into account when setting up a plywood factory.

Table 54. Average annual distribution of forestry production and wood processing in Côte d'Ivoire during the last ten years (1995–2005)

Processed products	Volume (m^3/year)
Sawnwood	515,518
Peeled veneer	206,494
Sliced veneer	12,555
Plywood	60,175
Moulding	17,737
Wood flooring/panelling	11,100
Total	**811,501**

Source: Ministère des Eaux et Forêts

A large part of this production – 59%, or 39,425 m^3 – is destined for the export market, while 41%, namely 27,188.38 m±, represented domestic consumption in 2004. A similar trend has been noted for 2005, and this is because the export market is more profitable as far as West Africa is concerned.

Difficulties involved in production

From the point of view of the utilization of raw materials, two factors are apparent:

- low tree density; and
- the reduction of harvesting diameters, which increases harvesting costs.

From the point of view of the production of plywood:

- the inadequacy of peeling equipment in some workshops results in low output; and
- the value-added achieved by the production of plywood is not related to the profitability of export of unprocessed veneers.

From the point of view of marketing and export:

- the high cost of freight;
- the high cost of FOB; and
- the cyclical unavailability of ships in the two ports of Côte d'Ivoire.

Challenges and prospects

- There is a need for re-investment in order to modernize and adapt production equipment to the diameters of the logs and increase output, as well as to improve the quality of the product. The domestic market is buyer and seller, hence the present increase of plywood factories by 23% compared to 2004 in order to take into account the needs of local joinery shops; this increase is because of the development of real estate infrastructure and the furniture market. Considering the high rate of growth in the Ivorian population, one can assume that the prospects are good.
- As far as plywood produced in Côte d'Ivoire and intended for export is concerned, the quality of the offer meets international standards. In this regard, the operators in the sector receive very few complaints. Hazards resulting from the political crisis do not permit compliance with all the demands and thus have contributed to the suspension of several contracts (late ships, lack of respect for delivery time-limits, increasing production costs).

- Côte d'Ivoire's expertise in plywood production permits the industry to adapt to a varied range of requests as well as provide choices in quality and sizes.
- In the medium term, there exists a supply of raw material able to satisfy an increase in production. The annual potential of timber intended for peeling is estimated at 1,500,000 m^3 for a total of harvestable timber reaching 2.5 million m^3 per year, in accordance with the forest management plan for 1998–2005.

Technological development in plywood production and the strengthening of the tropical plywood industry

The characteristics of plywood production in Côte d'Ivoire are:

- the process: plywood is derived from peeled veneer with a thickness of 1.1–3.6 mm and sliced veneer with a thickness between 0.5 and 0.6 mm;
- the thickness of plywood varies from 3 to 30 mm after pressing;
- the measurements available are in accordance with international standards. Certain units that manufacture isoplane doors produce door formats.
- the numbers of plywood manufacturing units has increased during the last ten years, but because of competition with Asian countries it is not certain that the economical operators of Côte d'Ivoire will continue to increase production;
- the modernization of plywood manufacturing factories is slow because of the high cost of imported spare parts and glue. Nevertheless, certain veneer-peeling factories are in the process of modernizing and one can currently observe the opening of new veneer factories. The increase in Ivorian production will depend on the demand for and price of plywood in the international markets; and
- it is more profitable for the economical operators to export veneer than plywood because of the high cost of importing glue and spare parts and of freight.

Supplying factories with raw material

The supply of timber for the factories comes from two sources:

– the rural areas, which supply 80% of the volume of harvested logs; and

– the classified forests of the permanent public estate, which supply 20%.

At least ten species are used in the production of plywood (Table 56).

Table 56. Species used in the production of plywood

Species (commercial name)	Scientific name	Classification according to importance of volume and frequency of use by the factories
Fromager	*Ceiba pentadra*	+++
Illomba	*Pycnanthus kombo*	+
Kapokier (oba)	*Bombax buonopozense*	–
Ako	*Antiaris africana*	–
Kondroti	*Rodognaphalon breviscus*	o
Tiama	*Entandrophragma angolense*	o
Koto	*Pterygota macrocarpa*	o
Zaïzou	*Gymnostemon zaizou*	o
Bi (eyong)	*Eribroma oblonga*	o
Sipo	*Entandrophragma utile*	o

Key:
+++ = volume and frequency important
+ = volume and frequency less important
– = volume and frequency of low importance
o = volume and frequency negligible

Long-term management and responsibilities in forest production

The forestry reform of 1994 divided Côte d'Ivoire into two ecological zones regarding forestry:

- the north, situated in the savanna zone, above the 8° parallel, where harvesting is generally banned; and

- the south, located in the forest zone below the 8° parallel, which is devoted to forestry. It consists of a sub-zone, referred to as pre-forestry, in the north part, which is less abundant in forest species, and a forest sub-zone in the southern part, where the density of forest species is highest. The harvestable rural area is sub-divided into forest concessions.

The harvesting standards that are currently in force in Côte d'Ivoire take into account not only the capacity of the area, as estimated by a 2% inventory, but also the potential growth of the forest according to the ecological zone.

Thus, the annual volume of harvesting is set at 0.25 m^3/hectare. The concessionaire is required to regenerate the forest at a rate of one hectare of reforestation for every 150 m^3 of wood removed from the pre-forest sub-zone and one hectare for every 250 m^3 removed from the forest sub-zone. The concessionaire is also subject to various annual taxes.

The classified forests are managed according to a management plan set up by the Société de Développement des Forêts (SODEFOR), which is a government corporation under the supervision of the Ministère des Eaux et Forêts (Ministry of Water and Forests) entrusted with the planning and supervision of the classified forests. At present for the 229 classified forests that exist in Côte d'Ivoire, SODEFOR has drafted 86 development plans, of which only 20 have been adopted by the state.

The difficulties in managing these forests have led the state to authorize SODEFOR to enter into operating agreements with the private sector in accordance with the new forest policy. In fact, during the present financial year (2005), six partnerships were signed, permitting these private companies in the forestry sector to start applying development plans under the control of SODEFOR.

The assessment of reforestation is ongoing. A study to re-evaluate this reforestation and its maps was initiated by the Ministère des Eaux et Forêts and financed partly by the economic operators of the forestry sector.

Côte d'Ivoire has a national working group for sustainable management and forestry certification, made up of government representatives, economic operators, researchers, environmental NGOs and the rural population.

For the future, one hopes to see the adoption of a new forest code that will bring about a revolution in the management of forest resources by enhancing the transfer of forest state ownership to individuals through private companies and territorial cooperatives. This would reinforce the responsibilities of entities other than those of the state regarding the protection and sustainable management of the forest heritage.

Forests in Côte d'Ivoire are in need of large investments if they are to be developed properly. Contributions are needed from donors to undertake projects that will help to achieve both property alleviation and environmental conservation.

Drafted by the directorate for production and forest industries of Côte d'Ivoire (DPIF/FIMEF),the technical consultant in charge of projects for the Ministry of Water and Forests of Côte d'Ivoire, and the syndicate of wood producers and industrialists in Côte d'Ivoire.

List of participants

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	Raynaud	Jean Claude	IN PRO BOIS	Director
Ecuador	Durini	Manuel	Endesa-Botrosa	President
	Klaic	Pedro	Endesa-Botrosa	Production Manager
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	Landrot	Jean Jacques	ATIBT	President
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	Attah	Alhassan	Ghana Forestry	Executive Director
Ghana	Hirsch	Thomas	Samartex Timber & Plywood	Deputy General Manager
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	Tsai	Cheng-ming	Island Woods Green Plus International Co. Ltd.	General Manager
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	Jalan	Madan	Arunachal Plywood Industries Ltd.	Chairman
	Jalan	Gitanjali	Arunachal Plywood Industries Ltd.	Chairman
	Kapa	V Prasad	Olam International Ltd.	General Manager
	Kumar	Ajay	NMBA	Senior Specialist
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	Haroen	Harmidy	APKINDO	
	Heron	Husni	Saratoga Capital	Director
	Koestomo	Robianto	Indonesian Wood Panel Association	Board Member
	Malik	Adoeng Abdul	Indonesian Wood Panel Association	Secretary General
	Phua	Lucky	PT Sumber Graha Sejahtera	Managing Director
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	Soeryadjaya	Edwin	Saratoga Capital	Director
	Suhardjojo	Njoto	APKINDO	Member of Board of Directors, Marketing Division
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	Sutanto	Agus	APKINDO	
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Country	Family name	Given Name	Organization	Title
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	Vantomme	Paul A.	ITTO	Assistant Director
	Yahaba	Kimio	Seihoku Corp.	Member of JPMA
	Yang	Lingyun	ITTO	Secretary
Latvia	Bikis	Uldis	A/S Latvijas Finieris	Chief Executive Officer
Malaysia	Bin Sarman	Shahrol Anuwar	Ministry of Plantation Industries and Commodities, Malaysia	
Malaysia	Chew	Bang Chyuan	Malaysian Timber Council Shanghai Office	General Manager
	Chew	Lye Teng	Malaysian Timber Certification Council	Chief Executive Officer
	Lau	Lee Kiong	KTS Timber Industries BHD	Deputy Director
	Lau	Lillian	Jaya Tiasa Timber Products Sdn. Bhd.	Manager
	Lee	Hua Seng	Sarawak Timber Association	Chief Executive Officer
	Loke	Sim Wah	Malaysian Timber Industry Board	Director
	Sheikh Abdul Rahman	Sheikh Othman	The Malaysian Panel-products Manufacturers' Association	Chairman
	Tan	Seng Hock	Samling Plywood (Bintulu) S/B	Vice President
	Yong	Celina Kin Yii	Sarawak Timber Association	Member Services Officer
Mexico	Elizondo	Rodrigo	Forestal La Reforma S.A. de C.V.	Director General
Myanmar	Than Naing Oo		Myanmar Timber Enterprise	Manager
Philippines	Alcasid	Neslie Jason M.	RI Chemical Corporation	Technical Sales Representative
	Carlos	Carolina R.	RESINS INC.	General Manager
	Diez	Allan H.	RI Chemical Corporation	Sales and Marketing Manager
	Keh	Alfonso	Philippine Wood Producers' Association	Executive Vice-president
	Pchelintsev	Evgeny	SVEZA Overseas Trading Ltd	Managing Director
Singapore	Leong	Yew Kong		Managing Director
Spain	Garnica	Pedro	Garnica Plywood	President
Spain	Hernanz	Guillermo	Garnica Plywood Valencia De Don Juan	General Manager
Switzerland	Arda	Mehmet	United Nations Conference on Trade and Development	Head of Commodities Branch
	Laakso	Ari	Riga Wood Sarl	Managing Director
Thailand	Oonjittichai	Woratham	Royal Forest Department	Forest Officer
UK	Fripp	Emily		Natural Resource Economist
	Hewitt	James	Business Environment and Forests	Consultant
	Roby	Andy	UK Timber Trade Federation	Head of Environment and CSR
USA	Clarke	Stuart	Clarke Veneers and Plywood	President
	Elias	Edward	APA – The Engineered Wood Association	Director International Market
	Methot	Pierre	World Resources Institute	Program Director
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