



Reports from the Second Wood Science Seminar and the 4th Pacific Rim Bio-Based Composite Symposium

The Second International Wood Science Seminar *Subyakto, R & D Center for Applied Physics, Indonesian Institute of Sciences*

The Second International Wood Science Seminar was held at the R & D Center for Applied Physics, Indonesian Institute

of Sciences (LIPI), Puspiptek Serpong, Indonesia on November 6-7, 1998. This seminar was organized by R & D Center for Applied Physics, LIPI and Wood Research Institute, Kyoto University. This seminar was continuation of the first seminar that was held in Kyoto, Japan in 1996. The research activities of the institutions and laboratories that participate

in the cooperative program were presented in this seminar. The objective of this seminar was to discuss the research results for further development of individual research, as well as to find subjects for future research by exchanging information on the new technologies and wood resources, mainly between Japanese and Indonesian scientists. This seminar was attended by 52 Japanese scientists came from 15 institutions in Japan, 76 Indonesian scientists from 15 institutions in Indonesia, one scientist from the Philippines, and one scientist from Thailand. The seminar was also attended by representatives from LIPI and Kyoto University. During the two days of seminar 2 keynote lectures, 35 full papers and 58 introductory papers were presented. The topic of the seminar was divided into two areas, Wood Material Science and Wood



Presentation Scene



Seminar Audience



Banquet Scene

Bio-Mass/Wood Bio Science. All papers were compiled in Proceedings of the Second International Wood Science Seminar. In the first day, the seminar was officially open by Dr. Anung Kusnowo as the Indonesian Coordinator of the JSPS Core University Program in the Field of Wood Science. And followed by keynote address from Indonesia that was delivered by Mr. Abbas Adhar (The President of Indonesian Wood Panel Association/APKINDO) with the title of "Indonesian Wood Industries Facing the Economic Crisis". During the first day, the Memorandum of Understanding (MOU) about cooperation between LIPI and Wood Research Institute was signed by Dr. Anung Kusnowo and Prof. Masaaki Kuwahara. After presentations and discussions by the

participants, the seminar sessions were finished at about 16:30 and all participants were moved to Damai Indah Restaurant, Bumi Serpong Damai for banquet. All participants enjoyed Indonesian cuisine while others sang and danced together. This banquet was interestingly guided by Dr. Seca Gandaseca from IPB (Kyoto University alumni) in English as well as in Japanese. In the second day, besides the full paper sessions we also listened to the keynote address from Japan that was delivered by Prof. Mikio Shimada (Wood Research Institute, Kyoto University) with the title of "Production and Protection of Woods Based on Bioscience of Symbiotic and Saprophytic Fungi". After all presentations were finished, the seminar was officially closed by Mr. Soehartono Soedargo the representative from LIPI.



Seminar Participants

Before all participants went back home, we took photograph together in the front of the seminar hall for a memory. "Matta aimasho", hopefully we will see you again in The Third Wood Science Seminar that will be held in Kyoto, Japan in the year 2000.



Symposium Venue: Novotel Hotel

The Fourth Pacific Rim Bio-Based Composites Symposium

Kazuya Minato, Graduate School of Agriculture, Kyoto University

The 4th Pacific Rim Bio-Based Composite Symposium was held in November 2 to 5, 1998 at Bogor, Indonesia. More than 70 papers were presented for three days. This symposium has been held every two years: at Rotorua in 1992, Vancouver in 1994 and Kyoto in 1996. Because Indonesia is suffering from serious economic crisis, it was apprehensive whether the symposium can really be opened. Seren-



Bogor Botanical Garden

ity was recovered for the present, however we could see everywhere the influences of economic failure and the scars of disturbance.

Novotel hotel (Photo), the venue of symposium, is located at the hill area in the suburbs of Bogor. The symposium was started followed by the opening remarks by the president of Bogor Agricultural University, keynote address by Indonesian Minister of Forestry and Crops Estate, and special paper by Dr. R. M. Rowell (USDA). The oral presentations were performed in two parallel sessions. The topics were included several areas,

those were adhesives for biocomposites production, chemical modification of lignocellulosics materials, plywood, LVL, particleboard, fiberboard and mineral bonded biocomposites technologies, preservation technologies, weathering properties of wood and so on. In the evening of the 2nd day, banquet party was held at a restaurant near the hotel. In the midst of economic crisis, there would be many difficulties to have the party, nevertheless participants enjoyed fully the gorgeous Indonesian dishes and entertainments. Though I was surprised a little at the tepid beer, it became rather tasty as getting drunk. In Indonesia, people seem to keep out of cold drinks, and it may be better for the stomach.

On the last day, we had an excursion to the Bogor botanical garden (Photo) and Beautiful miniature of Indonesia in Jakarta. After the excursion, most of the attendants from Japan and Indonesia moved to Serpong where the 2nd International Wood Science Seminar was consecutively held.

It was the first time for me to visit Indonesia. I really remembered a proverb "Seeing is believing". I had culture shock and felt nostalgia for my childhood. Young vivid researchers and students in Indonesia raised the hopes in future of this country.

Finally I would like to express sincere thanks to the members of LIPI who took care of me very kindly during this visitation.

* Indonesian Science Institute (LIPI)
* Forestry Companies (usually in cooperation with universities and/or research institutes.

The following are the state universities which provide courses and conduct researches in wood science & technology :

* Bogor Agricultural University/IPB (Bogor, West Java)
* Gajah Mada University/UGM (Yogyakarta, Central Java)
* Mulawarman University (Samarinda, East Kalimantan)
* Lambungmangkura University (Banjarbaru, South Kalimantan)
* Tanjungpura University (Pontianak, West Kalimantan)
* Hasanudin University (Ujungpandang, South Sulawesi)
* Pattimura University (Ambon, Maluku)
* Cenderawasih University (Manokwari, Irian Jaya)

Compared to the universities at the developed countries, the universities in Indonesia generally lack an appropriate laboratory equipment, budget as well as a scientific information. This has resulted in the quantity and quality of the research which significantly influencing the research environment in the universities. Among the above state universities in Indonesia, only few universities have faculty members with Ph.D degree in wood science & technology. The above mentioned universities also have better laboratory equipment, have more budget, and have a closer contact with the funding sources agencies than the other universities. Therefore, these universities have more research activities which further produce a prominent progress in their specific research interest.

B. Research Issues in Wood Science & Technology

Their need for wood products is increased with increasing population. On the contrary, there is a tendency that the natural forest productivity is decreasing quantitatively and qualitatively due to the improper management of the forest, extensive shifting cultivation, land encroachment, and other socio-economic factors.

To solve these problems, some important activities have to be undertaken, among them are the increase in the productivity of the forest, improve the management of the forest related to global warming problems, and increase in the efficiency of forest resources utilization.

In consideration on the above issue, research and development activities in wood science and technology are directed to increase the efficiency of forest re-

Research and Development in Wood Science & Technology in Indonesia

WASRIN SYAFII

FACULTY OF FORESTRY

BOGOR AGRICULTURAL UNIVERSITY

A. Research Institutions and Its Facilities

Research and development in wood science & technology in Indonesia are conducted at several institutions such as:

* Universities
* Agency for Research & Development, Ministry of Forestry
* Agency for Research & Development, Ministry of Industry



Teak Transportation

sources through the following aspects :

- * Improve the quality of wood products.
- * Increase the yield of wood products.
- * Increase the quality and the yield of non wood forest products.
- * More diversification on wood products.
- * Utilization of lesser-known species and fast-growing species.
- * Utilization of small-diameter log and wood waste.
- * Utilization of by-products from wood processing industries.
- * Utilization of wood components for chemical and energy.

RESEARCH FUND

Research and development on wood science & technology are financed by various funding sources agencies, depending on the research institution proponent and topic of the research. Researches at the universities are classified into several groups according to the source of funds as follows :

- * Competitive Grant Research is financed by the Ministry of Education and Culture.
- * Integrated Excellent Research is financed by the Ministry of Research & Technology.
- * Inter University Center Research is financed by Ministry of Education & Culture.
- * Co-operative researches with forestry companies is financed by the companies.
- * Co-operative research with regional & international research agencies are financed by such agencies.

CONSTRAINTS IN WOOD RESEARCH ACTIVITIES

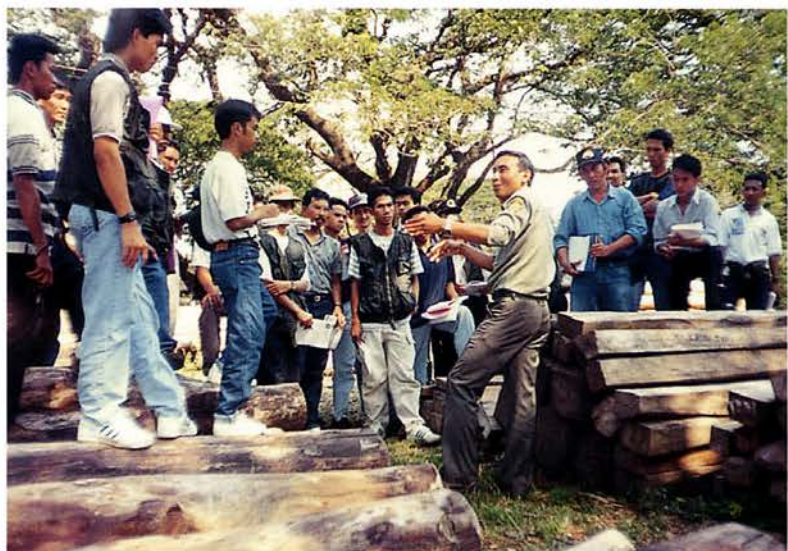
Generally most of wood research activi-

ties in Indonesia are applied researches, as well as those researches which are undertaken at the university. Many factors are responsible for this conditions, i.e. lacks of many sophisticated equipment to conduct fundamental research, the availability of funds, and demand of the funding sources which very often decide the level of research (applied research, fundamental research).

The followings are the problems usually encountered by the universities in conducting research on wood science &

technology :

1. Some constrains in conducting wood research are mainly lacks of equipment, very limited funds available, very few new scientific information (scientific journal and textbook) and indifference research atmosphere.
2. Very limited researchers who are willing and interested to undertake fundamental research at the laboratory due to financial constraint. They prefer to assist the forestry consultant since the financial compensation based on time allocation is quite high.
3. Up to this time, there is no scientific meeting at the national level. This affect to the knowledge gained and information acquired by the researchers, especially on the progress of the other researchers activities at their institutions which further resulted to the duplication of research topics.
4. At present, the job description, mission and mandate of each research institutions and universities are still unclear and hardly defined. This has made research activities in Indonesia ineffective and unefficient, because many institutions can at the same time undertake nearly the same research topics at the same level of investigation.
5. Interaction between universities and international research institution in undertaking research in wood science & technology is not sufficient.



Students Studying in Teak Forest

A Dream Comes True

Wahyu Dwianto
R & D Center for Applied Physics,
Indonesian Institute of Science (LIPI)

I graduated from the Faculty of Forestry, Bogor Institute of Agriculture (IPB) in June 1984. Eight months later, I was accepted as a researcher at the R&D Center for Applied Physics (RDCAP), Indonesian Institute of Science (LIPI). The Material and Composite Laboratory in RDCAP which I worked in was established just three years ago and only a few other researchers other than me were working there in early days. Most of my friends who graduated from IPB in the same year with me took positions in famous companies respectively. It took only a few years before they visited me in their own cars which are the status symbol in Indonesia. I thought how hard and unrewarding to work as a researcher to see their social and financial success. However I continued working there expecting fortune will smile on me some day. LIPI has been gradually well equipped and thanks to the strong leadership of Dr. Kahar, it soon began functioning very well as a research institute. Most of our researchers had a chance to go abroad to advance our studies in 1985. Bambang Subiyanto and Myrtha Karina came to Japan, Bambang Prasetyo went to Germany and Subyakto went Australia. I was also given the opportunity to visit Japan as an exchange researcher to Wood Research Institute of Kyoto University in 1986, 1988 and 1992. The cooperative research between RDCAP and Wood Research Institute (WRI) was started in 1983 under the JSPS-LIPI program. I learned how Japanese researchers proceed with their studies through this program.

I have been interested in pursuing my further studies in Japan since I first visited to WRI as an exchange researcher in 1986. We have a chance to get the Monbusho scholarship only once a year after going through the selection of Japan Embassy in Indonesia. I was depressed very badly in 1990 when Sulaeman Yusuf, my co-worker who was also in the waiting list to study abroad, succeeded to get the scholarship but I failed. I almost lost my hope at that time. However I didn't give up challenging and finally I passed the Japan Embassy's examination in 1993, thanks to the kind recommendation letter from Prof. Norimoto. My dream has finally come.

I will do my best to become a good researcher and will contribute to improve RDCAP into a substantial research institute which is attractive enough to the able researcher.

Life in Japan

I am proud of myself as a graduate student of Kyoto University, one of the most famous universities in the world. In the Property Enhancement Laboratory of WRI, I am the oldest among the very young and talented students. I have tried to do my best as much as possible not to disappoint any of my professors, my family and myself. I chose the technology of compression wood as my theme from among many basic research subjects, because it is more applicable to my home country.

This will be the final year for me at WRI and I have completed my research work to get the doctor's degree. I have submitted and published one preliminary report, three papers in international proceedings and eight papers in the international journals so far. I also gave presentations at the annual meetings of the Japan Wood Society every year from 1994 to 1998 and at two international

symposium in 1996. As for these achievements, I would like to express my gratitude to my professor, my associate professor and instructor for their unfailing guidance, advice, clear instructions and valuable discussions. I want to say thank you to all my fellow students who always encouraged me warmly. I wish to express many thanks to the Ministry of Education, Science and Culture of Japan as well for extending the financial support during my stay in Japan.

My wife and two sons came to Japan in November 1993, when my second son was only four months old. While we lived in Japan for more than five years, we got to know many aspects of Japanese culture. However at the beginning of our life in Japan, we were not able to socialize with the surrounding community for several months because of the language barrier or the difference of our customs. Then I decided to send my children to Hoikuen. Now they have many friends and speak Japanese like native children. Sometimes I even ask them to explain some amusing conversations in TV programs. They know almost a half of the 151 names of Pocket Monsters. They know all Japanese children's heroes, such as "Urutoraman". They like to eat at kaiten sushi bar. They really feel great in Japan. My life in Japan has been rich with not only academic experiences but also rich in a variety of cultural learning.



University Excursion to Miyajima

A Profile of the Research Project

Dimensionally Stable Compressed Wood & Composite Wood Products from Fast -Growing Trees by High- Pressure Steam Treatment (FY 1996-1998)

Principal Investigators: **Misato NORIMOTO**, WRI, Kyoto University

Myrtha KARINA, R & D Center for Applied Physics, Indonesian Institute of Science (LIPI)

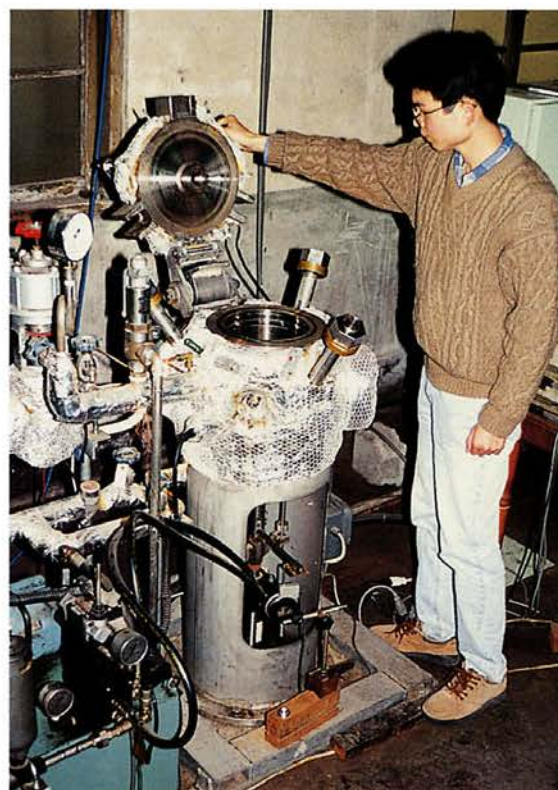
Cooperative Researchers: 3 Japanese researchers and 2 Indonesian researchers

This research is related to the mechanism of perfect fixation for the radial compressive deformation of wood by heat or steam treatment; i.e. the heating of wood under dry conditions and heating of wood while wet or with a high moisture content. Following five fruitful results were obtained from our research. (1) Fixation of the radial compressive deformation of wood was examined by three heating methods; i.e. under molten metal, in the presence and absence of air. The recovery of deformation (recovery of set) decreased in the order of heating in absence of air, heating under molten metal and heating in the presence of air, when compared with the same heating time and temperature. The relative modulus of elasticity and modulus of rupture for compressed wood by heating at perfect fixation were 88% and 78%, respectively. The results of mechanical tests, X-ray diffraction and IR absorption measurements suggested that the fixation of compressive deformation by heating resulted mostly from release of the stresses stored in both the microfibrils and the matrix by degradation of cell wall polymers. (2) The measurement of stress relaxation in the radial compression of wood under heat was made to confirm the mechanism of perfect fixation. An excellent correlation was observed between the recovery of set or the normalized residual stress and the weight loss, and the relationship was expressed by a hyperbolic equation. The ratio normalized residual stress was proportional to the recovery of set, indicating that permanent fixation by heat treatment was due to the release of stresses stored in the cell wall polymers by their degradation. (3) A method of measuring the viscoelastic properties of wood under high temperature steam con-

dition was proposed. A testing machine with a built-in autoclave was used. A newly developed load cell capable of resisting a steam pressure of 16kgf/cm² (200°C) was installed in the autoclave. This load cell could be used to detect loads precisely under steaming at temperatures of 100°C to 200°C. The non-uniform degradation of specimens could be minimized by minimizing the time required for attaining thermal equilibrium using the specimens conditioned to close to the fiber saturation point. (4) The measurement of stress relaxation and stress-strain relationship in the radial compression of wood under steam were made to clarify the mechanism of permanent fixation. The strain recovery (Sr) decreased with steaming time and reached almost zero within 10min at 200°C. The relationship between the residual stress and the Sr at the end of relaxation measurement could be expressed by a single curve regardless of time and temperature. The mechanism of permanent fixation by steaming was different depending

on the extent of Sr. Almost no chemical changes in the cell wall polymers occurred for Sr > 0.93. The reduction of Sr was caused by the release of stresses due to the degradation of hemicelluloses for Sr = 0.93 - 0.60. The increase in the regularity of crystalline lattice spacing of the microfibrils or the formation of cross-linkages between the cell wall polymers resulted in fixation for Sr = 0.60 - 0.20. The decomposition of hemicelluloses as well as lignin caused perfect fixation for Sr < 0.20. (5) Creep measurement in the radial compression of wood under steam was made to clarify the relationship between structural changes in the cell wall polymers and steaming conditions. The creep compliance curves for 30min (I) and those with pre-steaming for 30min (II) were well connected at 30min when the structural changes due to the degradation of hemicelluloses or the decomposition of lignin as well as hemicelluloses occurred. However, curve (I) at 30min differed markedly from curve (II) when the structural changes due to the increase of the regularity of crystalline lattice spacing of the microfibrils or the formation of cross-linkages between the cell wall polymers occurred. It was concluded that these two kinds of structural changes could be detected well by creep measurement.

(By T. Morooka)



Testing Machine with a Built-in Autoclave

Proposals for Future Projects

Under the JSPS Core University Program between Wood Research Institute (WRI) and the R & D Center for Applied Physics, Indonesian Institute of Sciences (LIPI) in the Field of Wood Science, many cooperative projects that were started in 1996 were completed this month, and new projects, which will begin in 1999, are introduced below.

Development of optimum machining and drying methods for fast grown species and lesser use species (FY 1999-2001)

Principal Investigators:
Kazuo HAYASHI, WRI, Coll. Agri. Ehime University
Edi S. Bakar, Fac. Forestry, Bogor Agri. University

Purpose of Research Topics

Considering the future wood supply in the world and the global environment, it is necessary to develop the optimum processing for the effective and long-lived utilization of fast grown species and lesser use species. However, the machinability and dryability for those species have been not enough studied. In this project, the nondestructive method will be developed for the detection of the characteristics to have so far been considered difficult to process and the sophisticated processing system will be build.

Significance and Expected Results

It is fast step to the sustainable use of wood that the elevating the reliability and durability and the supplying the material to input just low energy and to enable the recycle safety. As the optimum method for the most basic processing such as machining and drying is systematized for fast grown species and lesser use species scientifically and technologically in this study, these species enable to have many applications. Therefore this project will contribute to the sustainable use of forest product resources largely.

Softening Behavior and Its Application of Bamboo (FY 1999-2001)

Principal Investigators:
Misato NORIMOTO, WRI, Kyoto University
Wahyu DWIANTO, R & D Center for Applied Physics, LIPI

Purpose of Research Topics

The softening behavior of wood under the effects of water and heat has been widely reported in the previous studies. However, the above information for bamboo is still lacking. As far as bamboo is concerned research on its anatomical and utilization for handicraft making is rather well known, but the high technological bamboo processing methods have yet been developed. For example, traditional bamboo processing into airplane model and tea sets involve mainly bending by flaming technique, and setting of the bent section by cooling, which is different from the wood bending technique. This research project therefore focuses on the softening behavior of bamboo, its characteristics of large deformation, temporary setting of the deformation; and subsequently develop the fundamental technologies of dimensional stabilization and high technological processing of bamboo via the combined analysis of the above mechanisms. Further, bamboo fiberboards were manufactured by applying the techniques developed, and the properties of these boards were evaluated.

Significance and Expected Results

Owing to the exhaustion of wood based resources, bamboos, which are one of the fast growing species, has attracted a lot of attention for the production of lignocellulosic based

composite products. In order to achieve a better understanding of the physical properties of bamboo, this research covers the necessary information required by the industries. Consequently, this research covers not only the processing technology of bamboo, but also the fundamental studies for its utilization as a new raw material for lignocellulosic-based products with wide applications. Through the international joint efforts of Japan and Indonesia which are bamboo producing nations, it is not only possible to conduct bamboo researches of various natures for academic upgrading, but will also ensure efficient utilization of the global bamboo resources.

Development of Integrated Technology on High-Performance Utilization of Tropical Forest Resources (FY 1999-2001)

Principal Investigators:
Yuji IMAMURA, WRI, Kyoto University
Wiwik S. Subowo, R & D Center for Applied Physics, LIPI



Fungus-growing termites attacking timbers in a field test site at Serpong

Purpose of Research Topics

Weathering, decay, termite and fire resistances of wood composites from tropical forest resources are evaluated in Japan and Indonesia where are suffered with the severe climatic conditions. New methods are designed to upgrade these properties with environmental friendness. The wood extractive which are contained in the unknown tropical forest trees and contribute to durability will be analyzed.

Significance and Expected Results

To extend the life-span of wood utilization is highly required from the environmental concerns. The integrated technologies to provide wood with the high performance will be obtained through the cooperative research on weathering, physical and biological properties of the tropical forest resources.

Composting of Organic Wastes into Multifunctional Recyclates (FY 1999-2001)

Principal Investigators:

Minoru TERAZAWA, Fac. of Agri., Hokkaido University
Neni SINTAWARDANI, R & D Center for Applied Physics, LIPI

Purpose of Research Topics

Biological conversion (composting) of biomass wastes (food oriented wastes and human wastes, excetions) is an argent problem to be solved in Indonesia. The purpose of this project is the establishment of the composting systems using tropical sawdust as an artificial soil matrix in the composting system: Garbage Automatic Decomposer- Extinguisher (GADE) system is for food oriented waste (garbage) and Bio-Toilet(BT) system is for human wastes (excretions).

Significance and Expected Results

It has been demonstrated that combined utilization of organic wastes and sawdust becomes novel composting systems: the GADE and the BT system. Propagation of GADE and the BT systems in Indone-



sia could improve the people's living environment in the rural area and the composts derived from the operation of the GADE and the BT systems could help farmers for developing agroforestry in Indonesia.

Studies on the Effect of Silvicultural Conditions to the Wood Qualities of Plantation Teak (FY 1999-2001)

Principal Investigators:

Takeshi OKUYAMA, School of Agri., Nagoya University
Yusuf Sudo Hadi, Fac. Forestry, Bogor University of Agri.

Purpose of Research Topics

In order to contribute to the quality improvement of teak, the most important species for timber, we investigate the growth rate dependence of growth stress as well as the qualities. Moreover, the effect of girdling treatment given prior to the harvesting to the wood qualities will be revealed scientifically. Density, cell wall micro-structure, principal chemical components and juvenile wood region shall be compared on the specimens prepared from teak, regarding on the growth rate, tree age and the girdling treatment.

Significance and Expected Results

Nowadays after the timber trade of natural grown teak was prohibited, teak plantation is carried out actively in the tropical countries. However, the wood quality of planted teak is still under argument, especially it is a large concern for the tropical countries whether the quality of planted teak differs or not from that of natural grown one. This joint research reveals the effect of growth rate to the wood qualities, such as growth stress and density, etc. and proposes the silvicultural conditions so as to produce good qualities teak like natural grown teak. Moreover, the scientific bases shall be given to the effect of girdling treatment that has been done up to now. This research gives answer to the problems that almost an tropical countries have desired to be solved.

Zero Emission Processes for Oil Palm Utilization (FY 1999-2001)

Principal Investigators:

Shuichi KAWAI, WRI, Kyoto University
Bambang SUBIYANTO, R & D Center for Applied Physics, LIPI

Purpose of Research Topics

Oil palm residues such as trunks, fronds, and empty fruits bunches should be converted into different types of materials for more effective utilization of ligno-cellulosic materials and for the reduction of the pollutive substances in the regional area. This project aims to develop the total system for the utilization of oil palm residues; those are 1) Development of new ligno-cellulosic materials, 2) Conversion into pulp and paper, 3) saccharification, and 4) Carbonization of these residues. The mass and energy flows of the total system for oil palm utilization will be analyzed and optimized in order to establish the zero-emission processes.

Significance and Expected Results

The characteristic feature of this project is to focus the recycled utilization of oil palm residues with four different processes. The development of new ligno-cellulosic materials and the technology to eliminate the energy consumption can be expected. Analysis of mass and energy flows leads to the optimization of oil palm utilization to establish the zero-emission process.



The Committee of International Academic Exchange

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