OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

18047

Distr.
LIMITED

ID/WG.500/4(SPEC.)
18 January 1990

United Nations Industrial Development Organization

ORIGINAL: ENGLISH

Global Preparatory Meeting for the
Second Consultation on the Wood and
Wood Products Industry*

Nairobi, Kenya, 24-27 April 1990

SECONDARY WOOD PROCESSING IN ASIA AND THE PACIFIC

Background Paper**

Prepared by

Horatio P. Brion

UNIDO Consultant

* Organized by UNIDO in co-operation with the United Nations Centre for Human Settlements (Habitat).

** The views expressed in this document are those of the author and do not necessarily reflect the views of the Secretariat of UNIDO. Mention of firm names and commercial products does not imply the endorsement of UNIDO. This document has not been edited.

V.90-80489

EXPLANATORY NOTES

The currency exchange rates used in the collation of data for this paper are as follows:

China	: RMB	-	RMB	3.62	-	US$1.00
Fiji	: Dollar	-	F$	1.47	-	US$1.00
Indonesia	: Rupiah	-	-R-	1,788.00	-	US$1.00
Malaysia	: Ringgit	-	M$	2.74	-	US$1.00
Papua New Guinea	: Kina	-	K	0.85	-	US$1.00
Philippines	: Peso	-	PHP	21.47	-	US$1.00
Thailand	: Baht	-	฿	25.72	-	US$1.00
Singapore	: Dollar	-	S$	1.92	-	US$1.00
Vietnam	: Dhong	-	₫	3,850.00	-	US$1.00
Western Samoa	: Tala	-	WS$	1.52	-	US$1.00

The following acronyms were used in this Report:

AFFIA	-	Asian Federation of Furniture Industries Association
AFFMA	-	ASEAN Federation of Furniture Manufacturers Association
APPF	-	Asia Plywood and Panel Producers Federation
ASEAN	-	Association of Southeast Asian Nations
CLAS	-	Commercially-Less-Acceptable Species (Timber)
CIDA	-	Canadian Industrial Development Agency
ECDC	-	Economic Cooperation Among Developing Countries
EEC	-	European Economic Community
FAO	-	Food and Agriculture Organization of the United Nations
FINNIDA	-	Finish Industrial Development Agency
I.S.O.	-	International Standards Organization
JETRO	-	Japanese Export Trade Office
JICA	-	Japanese Industrial Cooperation Agency
LCA	-	Low-Cost Automation
NACIDA	-	National Cottage Industries Development Authority, Philippines
PDC	-	Philippine Design Center
SEALPA	-	Southeast Asian Log Producers Association
SPARTELA	-	South Pacific Regional Trade and Economic Cooperation Authority
TCDC	-	Technical Cooperation Among Developing Countries

U.N.	-	United Nations Organization
UNDP	-	United Nations Development Programme
UNIDO	-	United Nations Industrial Development Organization

A hyphen between numbers (e.g., 1-15) indicates the full range involved, including the beginning and end points:

A full stop (.) is used to indicate decimals.

A comma (,) is used to indicate thousands, millions, billions.

The following symbols and/or abbreviations are used in this Report:

&	-	and
Bd.Ft.	-	board foot, board feet
cu.m.	-	cubic meter
e.g.	-	for example
%	-	per cent

TABLE OF CONTENTS

I- INTRODUCTION

1.1 Background and Objectives of the Project

In its desire "to promote and accelerate the industrialization of the developing countries", the United Nations Industrial Development Organization (UNIDO) is making "every effort to increase the share of world industrial production in developing countries to 25% by the year 2000".

To this end, as specified in the Lima declaration, and as endorsed by the UN General Assembly at its 7th special session in September, 1975, UNIDO has been conducting global consultation meetings on selected industries since 1977. These meetings provide a forum for continuing North-South dialogue on specific industrial sectors and topics. The wood and wood products industry in developing countries was selected as one of these industrial sectors and the First Global Consultation on the Wood and Wood Products Industry was held in Finland, in September, 1983.

The Industrial Development Board of UNIDO has recommended to hold a Second Consultation on the Wood and Wood Products Industry during the 1990-91 biennium. As recommended by the First Consultation held in Helsinki, the next consultation will emphasize, without neglecting the primary industry, the secondary wood processing industry because of its wide economic and social potentials for the developing countries.

The UNIDO, therefore, has commissioned a survey mission to selected developing countries in Asia and the Pacific in order to up-date and expand the study "Regional Situation Paper: The Wood and Wood Products Industry of Asia, Its Current Status (1981-1982) and Future Development", which was prepared in 1982 in preparation of the First Consultation on the Wood and Wood Products Industry. The updated/expanded revision will form part of the background papers for the next consultation.

This study covers the wood and wood products industry in the Asia and Pacific region, highlighting the secondary wood processing industry, and with focus on constraints hindering the development of the sector, and ways and means to overcome those problems.

1.2 The Survey Mission and Other UNIDO Projects As Data Source

A detailed study of the secondary wood processing industry is handicapped by the fact that traditional sources of data/information on industry do not provide an accurate picture of the current status of the industry. Furthermore, in view of the large number of secondary wood products and, correspondingly, the availability of a number of ways one product may be manufactured, projections using existing data in the form they are currently available, could hardly represent an accurate trend for the industry. The negative effects of this handicap is diminished by using a survey technique which have proven successful and easily feasible in many other industry studies conducted by this Consultant. The technique involves interviews with industry leaders and visits to furniture/joinery factories to obtain more reliable industry data. This information is further strengthened by inquiries into existing and proposed policies, rules and regulations being enforced, and industry monitoring techniques, through interviews with government officials who are involved with the planning and implementation of industry development plans and policies, and those who, in one way or another, are responsible for monitoring or contributing to the growth of the industry.

This particular study project called for fact-finding visits (15-31 Oct. 1989) to the Kingdom of Thailand, the People's Republic of China and the Peoples' Democratic Republic of Vietnam, to look into the current status of and inquire about the country's plans for the future (at least up to the year 2000) for the respective wood processing industries of the three countries. Similar moves were done in conjunction with other related UNIDO projects conducted within last few months of 1989, to wit:

UNIDO PROJECT NUMBER & TITLE	PROJECT PERIOD
SI/SAM/88/801 - Assistance to the Quality and Improvement of Furniture Industries in Western Samoa	02 - 28 September 1989
DU/RAS/86/801 - Potentials for Downstream Timber Processing in Developing Countries of the Asia/Pacific Region	8 November - 8 December 1989

In conjunction with the above Projects, side trips were made to visit furniture/joinery manufacturing centers in Suva & Lautoka, Fiji (29 Sept. to 07 Oct. 1989), and in Manila and Cebu, Philippines (2 - 7 November 1989).

Industry data and information gathered during the conduct of the above-described missions were further complemented by corresponding data/ information accumulated during the conduct of other related UNIDO Projects within the last five years, to wit:

UNIDO PROJECT NUMBER & TITLE	Year Conducted
SI/SAM/88/801, ASSISTANCE TO THE FURNITURE AND JOINERY INDUSTRY of the KINGDOM of TONGA	1988
SI/SOI/86/803 ASSISTANCE TO THE WOOD PROCESSING INDUSTRY OF THE SOLOMON ISLANDS	1986
DP/RAS/86/075 TECHNICAL ASSISTANCE FOR THE DEVELOPMENT OF THE FURNITURE and JOINERY INDUSTRIES of WESTERN SAMOA	1988
DU/RAS/86/075 TECHNICAL ASSISTANCE to the FURNITURE AND JOINERY INDUSTRIES of the MARSHALL ISLANDS	1987
DU/RAS/86/075 TECHNICAL ASSISTANCE TO THE WOOD PROCESSING INDUSTRIES OF THE FEDERATED STATES OF MICRONESIA	1987

II- THE WOOD PROCESSING INDUSTRY (MECHANICAL PROCESS)

Tropical forests of the Asia/Pacific Region provide a sizable resource base for wood processing activities. Even at an annual depletion of about one million hectares, there are still more than 290 million hectares of forest lands in the area. (See Table I).

Indonesia and Papua-New Guinea possess a little more than 50% of the forest lands. Together with the other Southeast Asian countries, they possess more than 70% of the tropical forest lands in Asia and the Pacific.

Tables II and III show the industrial roundwood production and export data for selected Asia/Pacific Developing countries during the decade 1978-1987. It is indicated that the log production of most of the subject countries is not only big enough to support existing primary processing factories, but good enough to provide inputs for additional primary processing plants.

The timber resources of this area, therefore, deserve a more detailed assessment in any study on the current status and future development of the wood processing industry in the world.

2.1 INPUT SOURCES FOR THE SECONDARY WOOD PROCESSING INDUSTRY IN ASIA and the PACIFIC

The principal materials input of the secondary wood processing industry are: sawn timber (lumber or sawnwood) and wood-based panels (e.g. plywood, particle board and fibreboard). These are manufactured in varying levels of output in most of the Asia/Pacific developing countries selected for this study.

2.1.1 Sawn Timber

The production of sawntimber is a major activity of the primary wood processing industry of the Region. Tables IV and V show the production and export, respectively, of sawn timber for selected Asia/Pacific developing countries during the period 1978-1987. It will be noted that the general trend is for increasing production outputs. However, more recently, less and less of the sawntimber output was exported as a result of the efforts of ASEAN timber-rich developing countries to engage in more wood processing activities, particularly

TABLE I
TROPICAL FOREST COVER OF
SELECTED ASIA/PACIFIC DEVELOPING COUNTRIES
(As of Year End 1980; x 1,000 Hectares)

COUNTRY	BROADLEAVED	CONIFEROUS	BAMBOO	MANGROVE	TOTAL	% of TOTAL
I- ASIA						
Burma	31,718	118	632	812	32,280	10.69 %
Brunei Darussalam	323	-	-	7	330	0.11 %
India	46,044	4,537	1,440	96	52,117	17.26 %
Indonesia	113,575	320	-	2,500	116,395	38.55 %
Kampuchea	7,150	18	380	10	7,558	2.50 %
Laos	7,560	250	600	-	8,410	2.79 %
Malaysia	20,995	-	-	674	21,669	7.18 %
Papua-New Guinea	33,710	520	-	553	34,783	11.52 %
Philippines	9,320	190	-	240	9,750	3.23 %
Thailand	8,135	200	900	313	9,548	3.16 %
Vietnam	7,400	170	1,200	320	9,090	3.01 %
Total	284,930	6,323	5,152	5,525	301,930	100.00 %
% of Total	(94.37%)	(2.09%)	(1.71%)	(1.83%)	(100.00%)	
II- PACIFIC AREA						
Fiji	N/A	N/A	N/A	N/A	890*	72.24 %
Solomon Is.	N/A	N/A	N/A	N/A	289	23.46 %
Western Samoa	N/A	N/A	N/A	N/A	53	4.30 %
Total	-	-	-	-	1,232	100.00 %

SOURCES: FOREST RESOURCES OF TROPICAL ASIA, Tropical Forest Resources Assessment Project, GEMS, FAO, UN 32/6./301-78-04, Technical Report 3 , Rome, 1981
ASSISTANCE TO THE WOOD PROCESSING INDUSTRY-SOLOMON ISLANDS, UNIDO DP/ID/Ser. B/569, Vienna 1987
WESTERN SAMOA, A TRADE AND INVESTMENT GUIDE, South Pacific Bureau for Economic Cooperation, Asia-Pacific Research Unit, Wellington, 1982
ANNUAL REPORT FOR THE YEAR 1986, FORESTRY DEPARTMENT, Parliamentary Paper No.8 of 1989, Suva, 1989.

Legend: N/A: Not available during mission period
* : Includes Plantation Forests
- : NIL, Zero.

TABLE II

INDUSTRIAL ROUNDWOOD PRODUCTION IN SELECTED ASIA/PACIFIC DEVELOPING COUNTRIES

(x 1,000 cu.m.)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
I- ASIA										
Brunei Darussalam	130	141	134	202	213	214	214	214	214	215
Burma	2197	2535	2949	2659	2853	2476	2813	2831	2940	2962
China	73786	77996	79202	75748	78092	81324	91007	94545	97247	98908
India	18255	18945	19684	20453	21255	22093	22968	23882	23958	24034
Indonesia	29912	28249	30922	26522	25515	28719	30076	26614	30581	28228
Kampuchea	553	567	567	567	567	567	567	567	567	567
Laos	228	220	222	187	227	264	241	350	318	321
Malaysia	29636	29659	29071	31823	33906	33990	32297	29866	31105	36351
Papua-New Guinea	1356	1288	1752	1525	2223	2090	2079	2096	2359	2698
Philippines	9820	9287	9108	7880	7088	7244	6969	5738	5630	6015
Thailand	4686	5227	4720	4018	4034	4131	4390	4281	4460	4633
Vietnam	3135	3188	3099	3128	3158	3188	3218	3250	3283	3318
II- PACIFIC AREA										
Fiji	158	195	236	211	168	185	168	212	212	212
Samoa	53	61	61	61	61	61	61	61	61	61
Solomon Is.	239	279	273	325	363	351	458	379	379	379

SOURCE: YEARBOOK OF FOREST PRODUCTS, 1987, FAO Forestry Series No. 22, FAO Statistics Series No. 87, Rome, 1989

TABLE III

INDUSTRIAL ROUNDWOOD EXPORT FROM
SELECTED ASIA/PACIFIC DEVELOPING COUNTRIES
(x 1,000 cu.m.)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
I- ASIA										
Brunei Darussalam	-	-	-	-	-	-	-	-	-	-
Burma	77	85	77	77	102	123	148	152	147	147
China	67	66	60	59	64	74	93	44	44	13
India	32	30	30	6	7	7	7	1	61	61
Indonesia	20694	19517	16314	6957	3524	3494	2059	479	532	812
Kampuchea	7	7	7	7	-	-	-	-	-	-
Laos	15	17	18	10	7	5	10	6	34	34
Malaysia	17227	16791	15717	16485	19952	19457	16464	20136	19159	29957
Papua-New Guinea	615	615	773	844	1212	1173	1458	1285	1414	1542
Philippines	2200	1248	1154	1683	1590	1017	1323	679	427	200
Thailand	17	1	1	7	6	-	-	-	-	-
Vietnam	-	-	-	-	-	-	-	-	-	-
II- PACIFIC AREA										
Fiji	-	-	13	2	2	2	16	4	4	4
Samoa	-	-	-	-	-	-	-	-	-	-
Solomon Is.	262	263	263	320	333	338	284	371	349	170

SOURCE: YEARBOOK OF PRODUCTS, 1987, FAO Forestry Series No. 22,
FAO Statistics Series No. 87, Rome, 1989.

TABLE IV

SAWN TIMBER PRODUCTION IN
SELECTED ASIA/PACIFIC DEVELOPING COUNTRIES
(x 1,000 cu.m.)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
I- ASIA										
Brunei Darussalam	63	67	60	95	99	90	90	90	90	90
Burma	391	432	432	536	644	531	505	524	483	483
China	19156	20076	21010	22007	23064	23905	25761	27087	26391	26344
India	8999	10009	10976	12040	13209	14495	15907	17460	17460	17460
Indonesia	3501	3408	4815	5269	6818	6315	6620	7086	7420	9120
Kampuchea	43	43	43	43	43	43	43	43	43	43
Laos	56	41	41	16	22	25	26	16	16	16
Malaysia	6019	5943	6371	5703	6398	7282	5933	5494	5525	6285
Papua New Guinea	138	138	187	124	124	124	124	117	117	117
Philippines	1781	1626	1529	1219	1200	1222	1200	1062	978	1233
Thailand	1572	1558	1543	921	911	950	1036	958	1027	1095
Vietnam	590	540	473	429	390	354	354	354	354	354
II- PACIFIC AREA										
Fiji	91	90	117	96	76	82	80	91	91	91
Samoa	20	21	21	21	21	21	21	21	21	21
Solomon Is.	11	18	19	22	26	22	14	17	17	17

SOURCE: YEARBOOK OF FOREST PRODUCTS, 1987, FAO Forestry Series No. 22, FAO Statistics Series No. 87, Rome, 1989.

TABLE V
SAWN TIMBER EXPORTS FROM
SELECTED ASIA/PACIFIC DEVELOPING COUNTRIES
(x 1,000 cu.m.)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
I- ASIA										
Brunei Darussalam	1	1	-	1	1	1	1	-	-	-
Burma	56	98	118	118	58	135	70	61	61	61
China	131	67	45	36	68	67	65	69	69	72
India	6	2	2	3	-	-	-	2	2	2
Indonesia	757	1284	1214	1182	1242	1798	2210	2214	2741	2833
Kampuchea	-	-	-	-	-	-	-	-	-	-
Laos	5	8	25	2	7	3	4	1	2	2
Malaysia	2827	3542	3320	2808	3137	3493	2888	2830	3081	3974
Papua New Guinea	47	47	45	24	21	20	18	17	9	6
Philippines	573	915	742	547	591	728	537	507	495	638
Thailand	16	7	2	1	1	1	2	11	29	83
Vietnam	-	-	-	-	-	-	-	-	-	-
II- PACIFIC AREA										
Fiji	9	7	13	4	6	7	11	9	9	9
Samoa	4	4	3	2	6	2	3	3	3	3
Solomon Is.	4	9	7	7	7	6	6	3	3	3

SOURCE: YEARBOOK OF FOREST PRODUCTS, 1987, FAO Forestry Series No. 22, FAO Statistics Series No. 87, Rome, 1989.

the manufacture of furniture, joinery products, builders' woodworks and housing wooden components. Another feature of government policies on the sawmilling industry in the Region encourages higher productivity through the use of more efficient sawmilling facilities and techniques.

2.1.2 Veneer, Plywood and Plyboard

The manufacture of veneer and plyboard in the Region is not as well developed as the plywood manufacturing industry. Indonesia, the Philippines and Malaysia are the major plywood producing countries of the Region, with Indonesia ranking as the top exporter of plywood in the whole world during the last years of the 1980's. Tables VI and VII show the plywood production and export volumes, respectively, for the decade 1978-1987 in selected developing countries of the Asia/Pacific Region. Among the Pacific Island countries only Fiji manufactured and exported plywood.

Plywood is a major material input for the manufacture of furniture and joinery products and in the buildings construction industry.

2.1.3 Particleboard and Fibreboard

Only a few of the developing countries in the Asia/Pacific Region are engaged in the manufacture of particleboard and/ or fibreboard, (See Tables VIII & IX). Malaysia, China, India, the Philippines and Thailand manufacture both particleboard and fibreboard. China, having developed small capacity (5,000-10,000 cu. m. per year) particleboard and fibreboard plants (10-25 tons/day), has been successful in erecting and operating such small capacity factories nearer the source of raw materials in the far-flung provinces of the country and accounts for more than 50% of the production of particleboard and fibreboard in the Region. However, its domestic consumption of the material is so large that less than 5% of its total production of particleboard and none of its fibreboard production are exported. The Philippines and Thailand produce hard compressed boards. The particleboard output of Thailand is totally

TABLE VI

PLYWOOD PANELS PRODUCTION IN SELECTED ASIA/PACIFIC DEVELOPING COUNTRIES

(x 1,000 cu.m.)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
I- ASIA										
Brunei Darussalam	-	-	-	-	-	-	-	-	-	-
Burma	12	12	12	15	15	15	15	15	15	15
China	1535	1743	1630	1721	1634	1705	1490	1389	1511	1583
India	176	180	200	280	300	300	360	360	360	360
Indonesia	424	624	1011	1552	2487	3138	3600	4615	5750	6800
Kampuchea	2	2	2	2	2	2	2	2	2	2
Laos	1	1	2	3	5	5	5	5	5	5
Malaysia	465	490	601	603	787	938	783	711	711	857
Papua New Guinea	15	15	10	9	9	9	9	9	9	9
Philippines	490	515	553	463	434	469	504	357	445	517
Thailand	75	93	89	106	160	165	165	170	170	170
Vietnam	30	18	18	21	23	49	40	40	40	40
II- PACIFIC ASIA										
Fiji	3	3	3	4	4	4	4	5	5	5
Samoa	-	-	-	-	-	-	-	-	-	-
Solomon Is.	-	-	-	-	-	-	-	-	-	-

SOURCE: YEARBOOK OF FOREST PRODUCTS, 1987, FAO Forestry Series No. 22, FAO Statistics Series No. 87, Rome, 1989.

TABLE VII
PLYWOOD PANELS EXPORT FROM
SELECTED ASIA/PACIFIC DEVELOPING COUNTRIES
(x 1,000 cu.m.)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
I- ASIA										
Brunei Darussalam	-	-	-	-	-	-	-	-	-	-
Burma	1240	1091	868	951	822	867	601	556	505	544
China	15	7	7	6	6	6	6	6	6	6
India	70	117	245	760	1132	2106	3021	3784	4607	5488
Indonesia	1	1	1	1	1	1	1	1	1	1
Kampuchea	-	-	-	-	-	-	-	-	-	-
Laos	410	466	474	467	402	479	400	363	452	680
Malaysia	6	6	6	8	6	5	5	1	-	-
Papua New Guinea	383	417	367	398	249	312	269	269	256	260
Philippines	1	2	2	4	2	2	2	2	6	72
Thailand	-	-	-	-	-	-	-	-	-	-
Vietnam										
II- PACIFIC AREA										
Fiji	-	-	-	-	1	-	1	2	2	2
Samoa	-	-	-	-	-	-	-	-	-	-
Solomon Is.	-	-	-	-	-	-	-	-	-	-

SOURCE: YEARBOOK OF FOREST PRODUCTS, 1987, FAO Forestry Series No. 22, FAO Statistics Series No. 87, Rome, 1989.

TABLE VIII
PARTICLEBOARD PRODUCTION & EXPORT,
SELECTED ASIA/PACIFIC DEVELOPING COUNTRIES
(x 1,000 cu.m.)

	1978		1979		1980		1981		1982		1983		1984		1985		1986		1987	
	Prd	Exp	Prd	Exp	Prd	Exp	Prd	Exp	Prd	Exp	Prd	Exp	Prd	Exp	Prd	Exp	Prd	Exp	Prd	Exp
I- ASIA																				
Brunei Darussalam	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
China	87	-	96	-	121	9	120	4	146	11	170	13	208	10	225	5	253	5	267	10
India	16	1	21	1	28	1	31	8	28	6	30	6	32	6	32	6	32	6	32	6
Indonesia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kampuchea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Laos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Malaysia	2	1	4	4	3	3	5	5	6	6	6	6	6	6	6	6	6	6	6	6
Papua New Guinea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Philippines	3	3	4	4	5	5	5	5	5	1	8	2	3	-	2	-	4	-	4	-
Thailand	5	-	10	-	9	-	11	-	28	-	33	-	33	-	31	-	43	-	43	-
Vietnam	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
II- PACIFIC AREA																				
Fiji	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Samoa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Solomon Is.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOURCE: YEARBOOK OF FOREST PRODUCTS, 1987, FAO Forestry Series No. 22,
FAO Statistics Series No. 87, Rome, 1989.

Legend: Prd: Production
Exp: Export
- : Nil, Zero

TABLE IX

FIBREBOARD PRODUCTION & EXPORTS,

SELECTED ASIA/PACIFIC DEVELOPING COUNTRIES

(x 1,000 cu.m.)

	1978		1979		1980		1981		1982		1983		1984		1985		1986		1987	
I- ASIA	Prd	Exp	Prd	Exp	Prd	Exp	Prd	Exp	Prd	Exp	Prd	Exp	Prd	Exp	Prd	Exp	Prd	Exp	Prd	Exp
Brunei Darussalam	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
China	361	-	461	-	538	-	600	-	707	-	772	-	773	-	932	-	1064	-	1348	-
India	32	1	32	2	20	2	42	1	45	1	50	1	46	1	46	1	46	1	46	1
Indonesia	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-	1	-
Kampuchea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Laos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Malaysia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Papua New Guinea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Philippines	64	-	73	-	68	-	66	-	63	-	63	-	63	-	63	-	63	-	63	-
Thailand	42	7	31	7	30	6	42	7	35	8	51	12	67	15	40	18	52	26	54	21
Vietnam	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
II- PACIFIC AREA																				
Fiji	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Samoa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Solomon Is.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOURCE: YEARBOOK OF FORFST PRODUCTS, 1987, FAO Forestry Series No. 22, FAO Statistics Series No. 87, Rome, 1989.

Legend: Prd: Production
Exp: Export
- : Nil, Zero

used for domestic purposes. A major portion of Thailand's fibreboard output is used domestically, and only about 40% is exported to neighboring countries. Malaysia produces particleboard but does not produce fibreboard. Indonesia produces a small quantity of fibreboard but does not produce particle board in commercial quantities.

2.2 The Secondary Wood Processing Sector

2.2.1 Overview of the Industry in Asia and the Pacific Region

The manufacture of furniture, joinery products and builders' woodworks are the major industrial manufacturing activities in the secondary wood processing industry of the Asia/Pacific Region. A significant volume of wood is also used in the housing and buildings construction industry of the Region, not only as building components but also as form lumber, scaffolding material and for other utility purposes. The manufacturing sub-sector of the industry has shown a significant shift from the craftsman system to the mechanized techniques of production operations during the last decade (1978-1987). Within the manufacturing sector itself, all timber-rich developing countries of the Region have imposed rigid restrictions or total ban on the export of roundwood. Some countries, the Philippines and Thailand, for example, have totally banned the export of sawn timber, whether air- or kiln-dried. Indonesia has imposed prohibitively large export duties on sawntimber, while Malaysia has banned the export of selected species of sawntimber, and is contemplating on imposing increased export duties on the other species of sawntimber. The over-all effect of these country policies covering the export of logs and sawn timber is to encourage more downstream timber processing. In particular, the timber-rich ASEAN nations have adopted policies and are now implementing programmes designed to attain faster development of their furniture and joinery products manufacturing industries.

As the Asia/Pacific countries become more and more concerned with the obvious depletion of their resources of traditional timber species, their attention was concentrated on the use of non-traditional species as substitute materials input for the secondary wood processing industries. Furniture, and in some cases joinery

products, made from rubberwood has attained wide acceptance in the foreign market. Thailand exported rubberwood (locally called "PARAWOOD") furniture worth more than US$ 80,000,000 during the last two years. Malaysia and Singapore have also built a sizable volume of exports of "PARAWOOD" furniture items. On the other hand, use of coconut wood in housing and buildings construction industry is gaining wide acceptance in the Philippines, while the Pacific Island countries, led by the Republic of the Marshall Islands has set up programmes to to process coconut tree stems into coconut lumber as a substitute for imported timber species. Another development during the decade resulting from the depletion of the resources of traditional timber species is the more intensive use of minor forest products, such as rattan and bamboo, in the manufacture of furniture items. The Philippines and Thailand have developed multi-million dollar annual export industries for rattan furniture products. Malaysia and Indonesia also are both keenly interested in developing their rattan furniture industries into multi-million dollar export operations. The Philippines has proceeded further in the use of minor forest products as a material for its furniture manufacturing industry. The bamboo furniture industry of the Philippines has broken into the export market. The country has exported more than one million dollars worth of bamboo furniture annually during the last two years. Bigger share for bamboo is expected in the foreign market as the technical problems encountered in furniture production are solved to allow higher volume outputs and better quality products.

2.2.1.1 Wooden Furniture, Joinery and Builders' Woodworks

During the regional preparatory meetings (1982-83) in preparation of the First Global Consultation on the Wood and Wood Products Industry, a set of characteristics of the wooden furniture, joinery and builders' woodworks manufacturing industry was drawn to represent the typical profile of the industry in developing countries of the Region. Exceptions to the general picture are the few furniture and joinery factories which operate at higher levels of technology by virtue of their being subsidiaries

of trans-national firms, or because the local firm operates under certain marketing joint-venture arrangements whereby the foreign partner provides the local firm the technology required to produce the desired volume of the products with quality levels acceptable in the foreign market. The current picture, however, does not vary greatly from what it was in 1981-1982, for only a few of the medium-size wooden furniture and joinery firms were successful in developing their operations to higher levels of manufacturing technology. The following characteristics portray a realistic picture of the vast majority of the wooden furniture and joinery manufacturing industry in the Region today:

a) The industry is still highly fragmented, composed of manufacturing units having a wide scale of sizes --- ranging from family-owned and operated shops with less than 10 workers to factories employing 200 or more workers. Thus, in terms of direct contribution to the national economy, it is a common situation to find that the new large factories operating at higher levels of technology account for a much bigger share in the Gross Domestic Product than the combined outputs of the numerous small and medium shops;

b) While some of the more advanced factories operate with fully-mechanized, and in some cases, computer-controlled machines, a vast majority of the industry production units are still on the hand tools stage. However, the use of portable electric tools (such as hand planers, oscillating or belt sanders, drills, etc.) has become more popular in small shops where electric power is available. This has helped increase the productivity very slightly, but there is still much to be done about improving the quality of the products;

c) Although the common operating policy for the small- and medium-size furniture/joinery factories is to

produce whatever the customer wants to buy (ranging from small planter boxes, to hand-carved furniture items, copies of "antique" furniture pieces, and in some shops, even coffins), a number of the small and medium enterpreneurs have shifted to product specialization and serial production of furniture and joinery components which are supplied to the larger factories. The use of hobby-type woodworking machines has gained wide acceptance in this type of production operations, for the main reason that the small and medium-scale firms are usually not financially capable of acquiring the more costly models of heavy duty woodworking machines;

d) Quality levels of the products usually correspond to the minimum quality levels acceptable in the domestic market. The domestic quality level, however, has shown slight improvement during the last five years, presumably because the present customers are more aware of better quality furniture/joinery products, and the average small-and medium-scale factories have become more mechanized in their production operations;

e) Where before the use of insufficiently seasoned sawn-timber was a dreaded problem to the industry, the design, development and commercial scale production of low-cost timber seasoning equipment has helped improve the quality of furniture/joinery products in some of the Region's developing countries. However, there is still a great amount of work to be done to bring the cost of timber seasoning equipment down to levels affordable by a majority of the medium scale furniture/joinery manufacturers;

f) Poor "house-keeping" practices, inappropriate machinery lay-out and antiquated production techniques resulting to low productivity levels and poor workmanship still plague the majority of small-and medium-scale furniture/joinery factories;

g) It is not uncommon , even in medium-size factories in the Region, to find that the marketing manufacturing and administrative functions of the firm are supervised and controlled by one person (the owner) or a handful of assistance whose main qualifications are that they are blood-relations of the owner. Thus, inefficiency and inadequate supervision become great problems when the firm attempts to expand its operations;

h) Even medium-range marketing and manufacturing programmes are, as a rule, non-existent. A large proportion of the sales is derived from "walk-in" customers or "over-the-counter" sales. Thus, the widely accepted practices of production and inventory controls are either non-existent or are carried out at primitive levels, resulting to more materials wastage and high product cost;

i) Although some medium-size factories engaged in export-oriented operations have produced "knock-down" furniture items, the most common practice in the domestic market is based on deliveries of completely assembled furniture/joinery products, or at best, sub-assemblies which are assembled at customer's site. Thus, formal product packaging is usually almost non-existent. The packaging problem is further aggravated by product designs and manufacturing techniques that do not allow volume shipment of the products over long distances. Thus, market coverage is limited to areas a few kilometers away from the factory;

j) Except in three or four of the developing countries in the Asia/Pacific Region, the services of professional "furniture designers" are not available. In most of the countries in the Region, the available "designers" are usually people trained in arts and crafts schools along artisanal methods of manufacture. Thus, oftentimes, the existing furniture designs are poor copies or adaptations of furniture designs from the developed countries of Europe and America, so that although aesthetically pleasing the furniture pieces are ergonomi-

cally incorrect and costly to produce;

k) The services of local technical consultants are available only in two or three of the developing countries in the Region. Thus, small-and medium-size furniture manufacturers are oftentimes discouraged to expand their operations when they are faced with technical problems that need the services of foreign consultants, whose services, more often than not, could be engaged at costs which the small-or medium-size entrepreneurs could hardly afford.

At best, it can be stated that whatever improvement that happened to the furniture and joinery industry of the Region was attained by the few firms which belong to the upper medium-size or large scale group of manufacturing operations.

2.2.1.2 Rattan Furniture And Furnishings

The manufacture of rattan furniture and furnishings showed remarkable rapid development during the last five years of the decade under study. This could be primarily attributed to at least three major factors, to wit:

a) The break-through in the design of and corresponding development of manufacturing techniques for "knock-down" rattan furniture and furnishings;

b) The increased availability of container vans at reasonable costs to the shipper, together with the establishment of huge container ports both at the points of loading and at the traditional export destinations of rattan products; and

c) The greatly increased demand in the foreign market for rattan furniture and furnishings in the face of much higher costs of conventional wooden furniture items.

Industrial machines have been developed to process (straightening, rounding, bending and sanding) rattan poles at

productivity levels many times higher than the primitive manual methods of doing the job. It appears that the problem of coating rattan with finishing materials has been satisfactorily solved and the solution has found wide acceptance in the foreign market.

Nevertheless, the rattan furniture industry still remains a labour-intensive undertaking. The development of machines which can satisfactorily replace the human hands in the final assembling and finishing of rattan furniture and furnishing items is not yet a definite possibility in the near future.

2.2.1.3 Other Types of Furniture Products

The use of bamboo in the manufacture of furniture has received more attention during the last few years of the decade. It appears that the Philippines has gained headway in this sub-sector of the industry and has been exporting modest volumes of bamboo furniture products during the last three years.

However, there are yet a number of constraints which have to be adequately overcome in order for the bamboo furniture industry to attain development levels now being enjoyed by the rattan furniture industry. Among these constraints are:

a) Bamboo poles come in greatly varying diameters, even within the same pole. The rounding process (like that done on rattan poles) can not be used to attain the desired uniformity in diameters of the bamboo poles without adversely affecting the strength properties of the material. At this stage of development, bamboo furniture manufacturers resort to size matching which is another labour-intensive and costly operation;

b) Unlike rattan, bamboo can not be bent to attain small radii of curvature. This property of bamboo leads to more straight-line features in the bamboo furniture

design than those used in rattan furniture;

c) Since bamboo is hollow inside, the traditional techniques of joinery and the conventional fasteners (screws, nails, etc.) could not be used to join furniture component parts. And because of the varying diameters of the material, any machining to allow the fabrication of good and secure joints has to be done on a case-to-case basis. Thus, interchangeability of component parts, which is an important requirement for volume production, can not be satisfactorily attained at this stage of the industry's development; and

d) The rind of the bamboo pole, even with vigorous scraping or sanding, remains hard and rather impervious to conventional types of finishing materials. Adequate finishing material adhesion to the bamboo surface is still a big problem for the industry.

The use of the mid-rib of the leaves of the "BURI" palm (*CORYPHA ELATA* Roxb.) in wicker type of indoor furniture has gained monentum in some countries of the Region and have been received with wide acceptance in foreign markets. Furniture manufacturing operations, using Buri as the principal material, is a very highly labour-intensive industry, more so than rattan or bamboo furniture production.

Another type of furniture design makes use of stone-inlays, instead of bone in-lays. This type of furniture has received great attention more recently as an after effect of the scarcity, and corresponding high cost, of the traditional materials for inlay works: mother of-pearl shells, whale bones, and ivory. Thin sheets of marble-like stones are cut and ground into various shapes (usually fragments of important and popularly known scenery, or animal silhouettes). These stone cut-outs are then glued into recesses cleverly gouged unto the wooden surface to attain a tight fit and "seemingly" even surface. The stone in-lay design is better highlighted with the use of the wooden components of

furniture for stone in-lay works follow the same mechanized procedure used in conventional furniture manufacture; the technique of making the recess on the wooden surface and attaching the stone in-lay into the recess is a purely manual operation. Vietnam and the Philippines are keenly interested and are exercising great efforts to develop further their stone in-lay furniture industries.

2.2.2 Current Status of the Industry in Selected Countries of Asia and the Pacific

The following paragraphs describe the current status of the secondary wood processing industries of the developing countries visited by the Consultant during the course of this and other UNIDO Projects as enumerated in Section 1.2 of this paper. All the countries visited have the common problem of lack of up-to-date and reliable data about the industry, as a whole. Even officials of the centrally-planned economies of the People's Republic of China and Vietnam have a hard time keeping track of the operations of small and some medium size woodworking shops in the remote urban areas of the two countries. Thus, the current industry status as presented in the following paragraphs draw heavily upon the results of interviews with industry leaders and government officials, and confirmed or revised on the basis of findings during visits to selected factories in the developing countries.

2.2.2.1 China

Industry leaders and government officials estimate the secondary wood processing industry of the country at around 3,500 furniture and joinery plants, all located in the urban centers of the country. A total employment of no less than 340,000 workers, technicians and supporting personnel is reported for the industry. The major manu-

facturing plants are located in the metropolitan areas of Beijing, Xianghai and Guangchow and are usually components of huge integrated wood proces-ing complexes which include sawmilling and wood-based panels manufacturing facilities. However, some individual furniture/joinery factories are reported to be operating in Xianghai and Guangchow.

The industry output is primarily for domestic consumption and is distributed through the state's system of public stores. A modest amount of furniture exports is made in Xianghai and Guangchow.

State-owned and operated furniture/joinery plants contribute a major portion of the industry output. Based on visits to state-owned woodworking plants in the Beijing area during 1981 and in November, 1989, the following characteristics may be deemed representative enough to describe the current status and changes in the industry during the last decade:

a) Although mechanization has increased at the machining stage of production operations, assembling and finishing operations are still primarily done with the use of hand tools and by hands;
b) Precision levels which allow interchangeability of furniture components have not yet been attained, so that major adjustments still have to be done by hand during the assembling stage of operation;
c) The use of locally designed and fabricated woodworking machines (planers, handsaws, mortizers, table saws, etc.) which are not capable of high degrees of precision machining lead to low outputs and mediocre product quality;
d) Production of wood-based panel-type of home and office furniture has developed more than the solid wood type, this being the effect of increased plywood, particleboard and fibreboard production in the country during the last few years;

e) More instances of Western influence on the furniture designs were noted lately; and

f) Manual transfer of workpieces from one work station to the next is still a common feature in the Chinese woodworking factory.

There are reports, however, that on the average, the furniture and joinery factories in Xianghai and Guangchow are more advanced in sophistication and technology than those visited in the Beijing area.

2.2.2.2 Indonesia

Estimates by industry leaders indicate that Indonesia's furniture and woodworks industry includes no less than 4,000 establishments of varying sizes and levels of sophistication of operations. In fact, officials of the wood-carving center in Jepara and vicinity, estimate 2,700 member units for the cooperative, with a total manpower complement of about 9,000 workers. This is the largest among the 22 cooperatives operating in eastern and central Java. More than 90% of these manufacturing establishments in the Jepara area belong to the small-scale level of operations. Less than 50% of the furniture/joinery factories in the country could be classified in the medium-scale level of operations. Visits to the woodworking installations in government-owned factories, privately-owned factories in the industrial estate in the suburbs of Jakarta and the major units of the furniture centers in Jepara and Surabaya, indicated the following characteristics which could best describe the secondary wood processing industry in the country:

a) The importance of and benefits to be gained by mechanization of woodworking operations has filtered down to the smallest of the woodworking shops which have resorted to the use of portable and hobby-type machines to help increase their outputs and improve their product quality;

b) There is an appreciable increase in the use of seasoned lumber as material input for the industry. The establishment of a local kiln-drying equipment manufacturing firm barely 3 years ago has placed the cost of kiln-drying equipment within the reach of many medium-size furniture woodworking firms;

c) Significant improvement in the quality and volume of the outputs of a number of local woodworking firms were noted, particularly those which received foreign technical assistance;

d) The greatest development strides were achieved in the rattan furniture and furnishings industry after the government completely banned the export of rattan poles three years ago;

e) An industrial estate for the woodworking industry is now under construction a few kilometers East of Surabaya, on the island of Java; while another is being planned in the vicinity of Samarinda, on the island of Kalimantan. These projects are expected to encourage a faster pace in the development of the secondary wood processing industry;

f) All of the industry leaders interviewed complained of the high turnover of skilled, highly-skilled and technical personnel in their firms, supporting views that the country is badly in need of facilities to train key personnel for the industry; and

g) Except for the few firms which belong to the upper bracket of the medium-size group and those in the large scale level of operations, all of the manufacturing units still exhibit most, if not all, of the negative industry characteristics described in Section 2.2.1 of this paper.

2.2.2.3 Malaysia

Including the 100 (more or less) furniture/woodworks firms in the eastern states of Sabah and Sarawak,

Malaysia is reported to have over 2,000 furniture and joinery products manufacturing establishments according to latest estimates of industry leaders. In spite of the visible progress attained by some of the more advanced wood processing firms, the government still feels that the industry development pace is too slow. This is primarily due to the slow progress made by the small-and medium-scale furniture/joinery manufacturers which compose more than 80% of the total secondary wood processing industry. The government is supporting the establishment of a "furniture village" in Olah Limpit, about 40 kilometers west of Petaling Jaya, in the state of Selangor Darul Eshan, in the hope that a faster development of the industry could be attained if common services and facilities which are beyond the financial and technical capabilities of small and medium furniture/joinery manufacturers to acquire and operate, are made available to the industry through government help.

The current status of the secondary wood processing industry of Malaysia may be reasonably described as follows:

a) Most of the few medium-size manufacturers who are already engaged in serial production techniques are handicapped by the varied and numerous types of products they manufacture. Specialization and complementation of manufacturing activities are found only among a handful of furniture manufacturers in the industrial estates on the suburbs of Jakarta and in the port city of Kelang;

b) While some of the small scale furniture/joinery shops have partially mechanized their production operations, a majority of the shops in the group still operate along artisanal methods of manufacture;

c) Poor "house-keeping" practices plague almost all of the small- and medium-scale shops, leading to wastage of valuable floor space and slowing down the transport of work-in-process from one work station to the next. The ultimate overall effect is low productivity;

d) Although some of the medium-scale shops have found the advantages to be gained using production jigs and fixtures, the full production potentials of the machines could not still be harnessed due to the crude design of jigs and fixtures;

e) Again, the chain of command and supervision, more often than not, is largely, if not totally, vested in the manager/owner of the small and medium-scale shop, so that there is no middle management; and, if there is floor supervision, it is kept so weak that routine decisions still have to be referred to the "boss";

f) Finishing operations in most of the medium-scale shops are antiquated and costly, so that finishing outputs are low and finish quality is good only for the domestic market; and

g) Most, if not all, of the industry characteristics which inhibit a desirable rate of development are still encountered in most of the small- and medium-scale furniture/joinery shops of the country.

2.2.2.4 The Philippines

Industry data supplied by leaders of the Chamber of Furniture Industries of the Philippines and the Association of Door Manufacturers of the Philippines, indicate that the current total number of establishments engaged in the manufacture of wooden, rattan and bamboo furniture, wooden joinery products and general woodworks items is approximately 2,500 units.

About 30% of the total number of units is found in the Metro Manila area, another 30%, in Cebu City

and suburbs, about 15%, in Angeles City (in Central Luzon) and vicinity, and the rest, scattered all over the urban centers of the archipelago.

About 60% of the shops are still in the small-scale industry level while another 20% of the total may be classified in the medium-scale level of manufacturing operations.

The current status of the industry is best described as follows:

a) Tremendous growth (with a sustained annual growth rate of 30% approximately) in the rattan furniture industry occurred during the last half of the decade;

b) Specialization of product outputs has started its favorable impact on the industry leading to the establishment of a good number of factories which produce one or a limited number of allied product types. They specialize in the production of wooden doors, knife blocks and chopping boards, wooden chopsticks or jointed boards for furniture components. Complementation, however, is still on an "experimental" stage and may not be fully exploited until standardization of product dimensions and design of some components are adopted as major accepted feastures of the industry;

c) The industry, as a whole, has attained a good degree of mechanization: even the small-scale shops still using hand tools are equipped with electric-powered portable tools, and most of the medium-size shops are highly mechanized. The big shops process, on the average, no less than 236 cu.m. (100,000 Bd.Ft.) of properly seasoned sawntimber every month;

d) Fortunately for the industry, the current efforts to supply skilled, and highly skilled Pilipino labour to other parts of the world (principally to the Middle East and Northern Africa) has led

to the establishment of a number of industry-oriented training institutions, which (whether by design or not) finds use of the secondary wood processing industry as one of the sectors where their graduates are initiated into actual industry operations. Another development is the re-orientation of the major curricular of government-run regional vocational schools (high school level) to more industry-oriented courses so that the graduates are better prepared for the more advanced training programmes in national labour training institutions thus cutting shorter their apprenticeship when they are hired by industry;

e) It appears that the major problems encountered in industrial finishing operations have been substantially and satisfactorily solved, so that more and more exports of furniture and furnishing items are already completely coated with finishing materials;

f) The establishment of a product development and design center has made available free consultancy services in furniture design and product development to the small- and medium-scale firms, which, otherwise, would not be financially capable of engaging such services from foreign countries;

g) In spite of the existence of a good number of institutions for training middle management and floor level personnel of the industry, still a good majority of the small-size shops and many medium-size firms have weak (or none at all) middle management staff and inadequately trained floor supervisory personnel; and

h) The favorable effects of serial production as a stepping stone towards higher volume (mass) production has been realized by many in the industry, so that it has become an interesting experience to see a good number of small- and

medium-scale furniture and joinery shops attempt to produce component parts of their end-produc[illegible] series as small as twenty pieces and attain a limited degree of inter-changeability of component parts.

2.2.2.5 Papua New Guinea

In spite of the huge timber resources of the country, the secondary wood processing industry of the country has barely grown at all. In fact, some of the industry leaders have indicated that the number of registered firms which actually are in operation today could be less than the 78 firms which were registered in 1981-1982. More visible growth is found in the industry subsector manufacturing components for pre-fabricated housing units and buildings' woodworks. The furniture and joinery sub-sector has more or less remained stagnant, as a whole. It is alleged that national policies on the timber industry still favor the primary timber processing sector and have not yet given enough consideration to create situations favorable to the faster growth of secondary wood processing. The existing manufacturing units are principally located in the country's urban centers much as Port Moresby, Lae, Goroko and Wewak, among others.

2.2.2.6 The Pacific Island Countries

Only a few of the Pacific Island Countries have natural forestlands with ample timber stands that can support a well-developed wood processing industry. Most, if not all of them, however, are extensively planted to coconut trees. In view of the recent development of techniques to process and utilize coconut wood in housing and construction, and the manufacture of furniture and joinery products, the small island countries which have extensive areas planted to coconut trees, but rarely having natural

forests of traditional timber species, have turned their attention to the coconut wood as a possible substitute for imported sawn timber.

Fiji, the Solomon Islands and Western Samoa, and possibly Vanuatu, could be counted among the Pacific Island Countries which have natural forest resources that can support a fairly-well developed timber processing industry. Thus, the corresponding secondary wood processing industries of these countries are visibly established. It is a common experience to find that the stage of development of the secondary wood processing industry in the island is directly related to the state of technological development of the country as a whole, which is much further below those of their Asian neighbors.

In spite of the fact that many of the island countries do not have a furniture/joinery industry to speak of, Fiji, the Solomon Islands and Western Samoa have developed their furniture/joinery manufacturing industries to levels which could completely support local needs.

Among the three countries, Fiji has the largest secondary wood processing industry, with no less than 50 small- and medium-size production units evenly distributed between the urban centers of Suva and Lautoka. About 80% of these units are amply mechanized to allow serial production of furniture/joinery components. However, the variety and wide range of product designs hinder more extensive practice of production by series. A small quantity of the industry's output is exported to neighboring island countries and Australia (under the South Pacific Regional Trade and Economic Cooperation Authority (SPARTECA).

The Solomon Islands have at least 19 shops engaged in the manufacture of furniture/joinery and builders' woodworks. 80% of those visited were concentrated in the urban center of Honiara, the national capital city in Guadalcanal Island. The rest are evenly distributed in Auki (in the island of Malaita), Munda (in the New Georgia Group of islands) and the capital towns of Santa Isabel and Choiseul islands. All the industry output is sold in the domestic market.

There are 15 manufacturing units in the secondary wood processing industry of Western Samoa. These are all located in the capital city of Apia, in the main island of Upolu. There is hardly any timber forest on Upolu, so that the country's secondary wood processing industry is totally dependent upon the neighboring island (Savai'i) for its sawn-timber supply. All the industry's output is sold in the local market. Because of the low quality of local furniture products, the country still imports a significant volume of furniture items for use in offices, public buildings and commercial institutions.

In general, it can be stated that the secondary wood processing industry of the Pacific Island Countries (including the tiny furniture/joinery industry in the islands of Truk, Pohnpei, Kosrae and Yap, which compose the Federated States of Micronesia, and the lone furniture manufacturing shop in the Republic of the Marshall Islands) are still in the early stages of mechanization, and producing high cost/low quality furniture/joinery products. Except for Fiji, all these islands import a significant portion of the countries' needs for secondary wood products.

2.2.2.7 Thailand

A total of about 400 furniture factories was reported to be in operation in the country in 1980. Industry leaders estimate that this has almost doubled today for the following reasons:

a) The accelerated growth of the furniture and components manufacturing sub-sector using rubberwood (PARAWOOD) as the primary raw material; and
b) A similar increase in the growth rate of the rattan furniture industry; during the last five years of the decade.

These are primarily due to the influx of imported manufacturing technology from the province of Taiwan and technical consultancy assistance from European countries.

About 40% of the industry is concentrated in the Bangkok area. The remainder is distributed among the industrial centers located in other areas of the country, e.g. Cheng Mai in the North and Cha Choeng Sao to the east of Bangkok. A few of the medium-scale wooden furniture factories visited during the 1981-1982 study have now grown to employ at least 200 workers and process monthly average sawn timber inputs of no less than 236 cu.m. (100,000 Bd.Ft). The large rattan factories which employed less than 1,000 workers eight years ago, have expanded both the volume and type of products they produce to require no less than 1,500 workers and a daily input of tens of thousands of linear meters of rattan poles having various diameters. The industry has received a significant amount of technical assistance from foreign sources: Taiwanese technology

for the manufacture of wooden furniture and European technical assistance for a more rational production system of rattan furniture and furnishing items and more market-oriented product designs.

The development of the Thai secondary wood processing industry is a near parallel to that of the corresponding Philippine industry, so that the salient features of the industries in both countries could very well be represented by the industry characteristics enumerated for the Philippine furniture and joinery industry in previous paragraphs of this paper. Among the few principal differences is in the manner the respective governments provide technical assistance in the design, product development, quality testing and marketing aspects of the industry through a single agency, "Furniture Development Centre" of the Industrial Services Institute (ISI). On the other hand, the Philippines provides similar services through three separate government agencies: the Philippine Design Center, for product design and development; the Philippine Trade and Training Centre for quality testing; and the Bureau of Export Promotions for marketing. Another salient feature of the secondary wood industries of the two countries is that Thailand's wooden furniture industry is more developed and has larger export volume than its rattan furniture industry, while the reverse is true for the Philippine furniture/joinery industry.

2.2.2.8 Vietnam

Industry leaders report the existence of about 25 furniture and joinery factories in the northern region of Vietnam, more than half of which are

located within 100 kilometers of the major city of Hanoi. Another 30 to 40 units are located in the Central and Southern provinces of the country, more than 60% of which are located in Ho Chi Minh City and vicinity. All of those factories are part of the state industrial system, and most, if not all, are major components or subsidiaries of wood processing complexes as was described in the previous paragraphs on China's secondary wood processing industry. These figures do not include the unknown numbers of small family type of furniture and woodworks shop which have appeared as a result of the recently adopted national "open-door" policy, relaxing the state's tight control on the industrial sector of the economy.

On the over-all, the current status of the secondary wood processing industry of Vietnam is a close replica of that of the People's Republic of China, although the latter is more and better mechanized than the former. Mechanization of the industry in Vietnam is carried on through the use of antiquated woodworking machines (and, of course, production techniques); most of the machines dating back to the French occupation of the country. Correspondingly, both productivity and product quality are low.

The industry exports a modest volume of furniture components and sports equipment, as a requirement of trade agreements with some countries in the centrally-planned economies of Europe (e.g., Czechoslovakia, Romania and the U.S.S.R.).

It can be stated, in general, that the secondary wood processing industry of Vietnam possess most, if not all, of the negative factors (described in

preceding sections of this paper) that hinder a rapid and satisfactory development of the industry.

2.2.3 Major Ingredients to the Further and Faster Development of the Secondary Wood Processing Industry in Asia and the Pacific

For purposes of formulating or revising national policies or programmes on the development of the secondary wood processing industries of developing countries in the Asia/Pacific region, it would be a great help to be able to identify the groups of existing wood processing firms which have the best potentials for further development and growth because these firms possess the necessary characteristics which enable them to respond positively to the technical assistance services usually dispensed under industry development programmes. A further useful move would be to prioritize the needs of these "positively-responding" firms so that the details of the industry development programme could be correspondingly formulated and drawn up. In this manner, it is deemed that industry development programmes thus formulated would be more responsive to the needs of the economy and development costs are better kept at desirable levels.

Previous studies indicated that only 5-10% of the total secondary wood processing industry complement engaged at small- and medium-scale operations currently possess such characteristics that will allow them to grow further and at a faster rate of development, and attain operating levels comparable to those of more advanced countries. The same set of characteristics still apply to the present situation. The characteristics are summarized as follows:

a) These factories are now engaged in serial production, whether at limited or intermittent scale or as a regular feature of their daily operations;

b) The factories are more or less fully mechanized, with machinery complements composed of basic and specialized types of machinery for secondary wood processing;

c) Daily production operations in these plants are controlled thru the application of the basic concepts of production management;

d) Evidence of rudimentary materials and supplies inventory control exist in these factories;

e) Production jigs and fixtures, although predominantly in crude form, are regularly used in these factories;

f) Quality of the furniture joinery or woodworks products of these factories are still below standards acceptable to foreign buyers, but with proper guidance the factories' operating procedures can improve product quality levels to meet export requirements;

g) Most usually, these plants have their own sawn-timber seasoning (kiln-drying) facilities and have developed drying techniques which allow more stability of the wooden product while in service under different inviron-mental conditions; and

h) The manufacturing plants are accessible to harbors or ports served by international shipping lines.

These manufacturing firms will be in need of financial and technical assistance in the following manner:

a) Financial assistance for the acquisition of additional machinery and fixtures which will increase the production capacity and improve the flow of materials-in-process;

b) Training of key production, supervision and technical support personnel in more advanced techniques and practices on the following factory activities;

   1) Production Management as applied to high volume production operations;

   2) Technique for the adequate and timely maintenance of plant machinery and cutting tools;

3) Product design and engineering;

4) Quality control systems and procedures for high volume production;

5) Packaging'crating systems for specific types of export products, using locally available packaging materials wherever possible;

6) More suitable costing systems for products of high volume production establishments;

7) Design, fabrication and use of more advanced production jigs and fixtures, which may involve pneumatics and hydraulic components whenever and wherever necessary;

8) Adequate factory waste exhaustion and disposal systems;

9) To minimize the need for acquisition of highly automated machinery, to train pertinent plant personnel in the design, installation and operation of Low Cost Automation (LCA) systems, to be applied to existing basic production machines; and

10) More effective wood drying and surface finishing methods.

c) Technical assistance in the marketing techniques of their respective products;

d) Advice on the techniques of industrial financial management suitable for high volume production operations (including inventory control and purchasing systems and practices);

e) Assistance in the development of timber-engineered products, particularly for buildings and infrastructure construction purposes; and

f) Assistance in the further use of wood as a packaging material.

III - THE MARKET STATUS FOR WOOD PRODUCTS FROM DEVELOPING COUNTRIES OF ASIA AND THE PACIFIC REGION

3.1 MARKETS: CURRENT STATUS AND OUTLOOK

With a huge total population of more than two billion people, the developing countries of the Asia/Pacific Region appear to be the biggest market itself for her processed wood products. And with an annual growth rate of 2% or more, the developing countries can assure themselves of a continuing lucrative market for processed wood products. However, a large majority of the developing countries in the Region have that level of economic development which have not yet developed the use of furniture/joinery products as a necessity, rather than a luxury, for their own people. This situation has kept the local secondary wood processing industry from exploiting fully the domestic market potentials.

Thus, during the early part of the past decade, exports from timber-rich developing countries of the Asia/Pacific Region were largely logs, sawn timber and plywood. Towards the middle and later parts of the decade, there was a marked shift towards the export of primary processed wood products rather than logs. (See Tables III, V & VII). A similar trend was observed in the case of secondary woodworks products. The top performers during the decade were:

a) Indonesia's plywood industry which grew at an average annual rate (in terms of production volume) of 150%;
b) Thailand's wooden furniture manufacturing industry which expanded at an average annual rate of 175%; and
c) The Philippines rattan furniture manufacturing industry which developed at an average annual rate of 54%.

In view of the latest trend in the Region whereby the timber-rich countries have opted for larger and faster engagements in "Downstream Timber Processing", their desire to attain more value-adding activities on the basic wood material, a continued and significant increase should be expected for the remainder of the century in the production and export of secondary wood products of the Asia/Pacific developing countries.

3.1.1 The Domestic Market for Secondary Wood Products

At the beginning of the decade under study, the domestic market was the principal outlet for secondary wood products of the timber-rich Asia/Pacific developing countries. Later in the decade, Indonesia, Thailand, Malaysia and the Philippines have relied less and less on the domestic market as their main outlet for their secondary wood products, for these countries have developed their secondary wood processing industry towards more export-oriented operations.

The heavily populated countries of China and India still rely on their respective domestic markets as the main outlets for their secondary wood products.

Fiji and Papua New Guinea produce a significant volume of prefabricated housing components, but these are exported rather than sold in the domestic market. Malaysia and the Philippines are still producing pre-fabricated low-cost housing and school building units with about 50% wooden components for local distribution.

All the other developing countries in the Region have their respective domestic markets as the main outlets for their secondary wood products. This situation does not seem to have any prospect for any major change up to the end of the century.

3.1.2 The Export Market for Secondary Wood Products

Table X shows the significant developments in the export activities of the major producers of secondary wood products among the developing countries of the Asia/Pacific Region. There was a steady annual increase of exports of secondary wood products during the decade. Among the salient features of the export market performance of the four major Asia/Pacific producers of secondary wood products during the decade are:

a) All the four developing countries posted a steady increase in the export of wooden furniture and furnishings. Indonesia

TABLE X

EXPORTS OF SECONDARY PROCESSED WOOD AND RATTAN PRODUCTS
FROM SELECTED SOUTHEAST ASIAN COUNTRIES
(In Million U.S. Dollars)

ITEMS	INDONESIA			MALAYSIA			PHILIPPINES			THAILAND		
	1978	1980	1987	1978	1980	1987	1978	1980	1987	1978	1980	1987
Wooden Furniture & Furnishings	1.71	5.02	64.07	9.56	13.58	20.49	2.85	7.40	10.60	8.45	22.13	156.00
Builders' Woodworks & Joinery Products	6.07	4.69	476.15	52.16	97.61	142.39	14.37	21.75	26.09	N/A	4.77	19.20
Rattan/Cane Poles, Splits, core, Mattings	22.41	57.42	196.68	N/A	N/A	35.38	-	-	-	0.03	-	-
Rattan Furniture & Components	-	1.19	14.90	N/A	0.36	4.03	14.76	41.98	94.91	2.05	6.42	24.75

Sources: ANNUAL REPORTS, Malaysian Timber Industry Board, Kuala Lumpur
ANNUAL REPORTS, Chamber of Furniture Industries of the Philippines, Inc., Metro Manila
ANNUAL REPORTS, Indonesian Woodworks & Furniture Manufacturers Association, Jakarta
The FURNITURE INDUSTRY IN THAILAND, Furniture Industry Development Center, Industrial Institute, Bangkok, 1981
EXPORT TRADE BULLETIN, 1986-1987, Department of Trade & Industry, Manila
RIC BULLETIN, Rattan Information Center, Forest Research Institute of Malaysia, Kepong, Kuala Lumpur
TRADE STATISTICS, Ministry of Industry, Republic of Indonesia
FORESTRY STATISTICS OF THAILAND (1987-88), Royal Forest Department, Bangkok, 1989
EXTERNAL TRADE, DEPT. of STATISTICS, Kuala Lumpur, 1985

Legend: - : Nil, Zero
N/A : Data not available during study period.

and Thailand, however, were the top exporters of the product, with Indonesia making an average annual increase of 364%, and Thailand, an average annual increase of 175%, based on increase of export values in the export of wooden furniture and furnishings during the decade;

b) Indonesia overtook Malaysia as the premier exporter of builder's woodworks and joinery products during the decade, registering an average annual increase of 774%, building up to a high of US$ 476-Million worth of exports of the product in 1987. The other three countries posted modest average annual increases in their export of the product, ranging from 8% for the Philippines to 17% for Malaysia;

c) As usual during the past two decades, Indonesia was still the top exporter of rattan/cane poles, splits, core, mattings among the developing countries of the Asia/Pacific Region. However, recent reports indicate that after the 1987 export peak of unprocessed and semi-processed rattan products amounting to US$ 196-Million, the recent ban on rattan poles export from the country led to negligible exports of the semi-processed form of rattan products in 1988 and 1989;

d) The Philippines and Thailand have banned the export of both raw and semi-processed rattan products;

e) All the four developing countries registered significant growth in their annual exports of rattan furniture and components during the decade. Indonesia started exporting rattan furniture products in 1980 and posted the largest average annual increase (164%) in exports of rattan furniture among the four countries, reaching the US$ 14-Million level by 1987. Although the Philippines showed the lowest average annual increase (54%) in export of rattan furniture, it was still the top exporter of the products among the four countries, with a total volume amounting to almost US$ 95-Million in 1987.

The major importers of secondary wood products from the developing countries of the Asia/Pacific Region during 1978-87, are essentially the same countries as those listed for the

preceding decade, to wit:

Product	Top-Importing Countries/Region
i - Wooden Furniture and Furnishings	EEC countries, U.S.A. and Japan
ii - Builders' Woodworks & Joinery Products	Japan, EEC and Middle East countries
iii - Rattan/Cane Poles, Splits, Core, Mattings	Hongkong, Taiwan Province and EEC countries
iv - Rattan Furniture	U.S.A., EEC countries and Australia

3.2 Trade Flows of Secondary Wood Products

3.2.1 Domestic Trade Flows

The same factors that hampered domestic trade flows for secondary wood products in the developing countries of the Asia/Pacific Region as reported during the early part of the decade, still exist today and prevent a speedier and fuller exploitation of the domestic market potentials for the secondary wood product.

Papua New Guinea has not improved its road networks and mainly relies on existing coastal shipping facilities to transport wood products from the northern coastal sources to the southern coastal towns.

Although latest reports indicate that Indonesia has improved its inter-island shipping system, the wood products consumers in the thickly populated islands of Java and Sumatra still complain about the high cost and unreliability, of transporting logs and sawn timber from the country's major source of tropical hardwood, the neighboring island of Kalimantan.

A similar situation on sea transport facilities still exists in the southern islands of the Philippines, where it is easier to arrange for transport of wooden products from the southern ports to the Metropolitan Manila area, in Luzon (about 800 to 1,100 kilometers away), than it is to find carriers that will transport logs and sawn timber from the main sources

in the island of Mindanao to the wood processing center in the island of Cebu (about 300 to 500 kilometers distance).

Since food and fuel are still given higher priorities for transport within India, the wood and wood products industry of the country suffers from both high transportation costs and lack of carriers for both raw materials and finished goods of the industry.

Inadequate sea transportation facilities also plague the wood and wood products industry in all the Pacific Island Countries.

Thus, no significant growth could be expected of the domestic trade flow for secondary wood products until the corresponding governments of the affected countries could do something to improve the land transport infrastructure and/or the domestic shipping systems in the developing countries of the Asia/Pacific Region.

3.2.2 International Trade Flows and Shipping

The extensive development of the container type of sea transport during the decade under study has provided a tremendous boost to the export of secondary wood products from developing countries of Asia to the traditional markets in Europe, the United States of America and Japan. Taiwan Province and Singapore have developed into the main staging and marshalling ports for container shipping operations. Seondary wood products bound for the American continents and Japan are gathered by small containerized vessels from various loading ports in Southeast Asian countries and brought to the container port of Kaoshung (Taiwan Province). The containers are then transferred to huge containerized vessels for shipment to final destinations in the American continents and Japan. However, there are medium-size containerized vessels which carry wood products cargo directly to Japan from southern ports of Asia.

A similar system exist for the transport of secondary wood products from southern Asian ports to the Middle East and

major European cities, Australia and New Zealand; using Singapore as the main staging and marshalling port.

Container shipping facilities for the Pacific Island Countries are not as well developed and offer less frequent voyages than those in service in southern Asia.

Based on the export performance (for the period 1980-1987) of the four major secondary wood products producing countries of the Regio .e salient features of the international trade flow of the goods from the Asia/Pacific Region are summarized as follows:

a) At least 35% of the Asia/Pacific Region exports of wooden furniture and components are shipped to the United States of America and Canada. Japan, like Australia, imports from 12% to 15% of the wooden furniture exports from Asian developing countries; while the EEC countries share about 11% of the total exports of wooden furniture products shipped from the Region. The balance is shared by Hongkong, the Middle East countries, and some of the socialist countries of Eastern Europe.

b) The United States (59.5%) and Japan (12.4%) are the top ranking importers of rattan furniture products from the Region. The EEC countries account for a total of 18.8% of the rattan furniture products exported from the Region. The balance is distributed among other European countries, Hongkong, Australia and New Zealand.

With the recent ban on the exportation of rattan poles from Indonesia, and tne severe restriction or ban of the exportation of logs and sawn-timber from other Asian countries the trade flow picture for the coming decade is expected to be significantly different from that for the current decade.

IV - UTILIZATION OF WOOD IN CONSTRUCTION IN SELECTED ASIAN AND PACIFIC DEVELOPING COUNTRIES

4.1 General Considerations

A comprehensive study on the use of wood in the buildings and construction industry requires the consideration of several factors which either encourage or cause people to be reluctant to use wood. Foremost of these factors, of course, is the cost of the material in the locality where it is used. This factor is closely related to the availability of the material. It is a common assumption that wood for housing and buildings construction costs less when it is easily available. Although this is true in many localities of the developing countries in the Asia/Pacific Region, there are places where abundance of other construction materials (for example, clay bricks, bamboo, etc.) prices them lower than equivalent quantities of wood. Under such situations, the builder would opt to use the lower cost materials. This situation is found in the northern provinces of Vietnam where clay bricks are more popular construction materials than wood; in some provinces of Central Luzon in the Philippines and the Trengganu state of West Malaysia where bamboo costs less than wood as building material. This brings forth the need for a closer look at wood in building and construction from the economic point of view.

In many developing countries of the Region the extended family type of social institution is still very much in practice. In fact, in many rural areas of the Region, particularly the Pacific Island Countries, the Philippine barrios far from urban centers and the far-flung provinces of China, to mention some examples, families are welcome to stay and live (for extended period of days, months or even years) with relatives. This social practice affects the type, size and interior arrangements of the dwelling units, which eventually leads to the question whether wood could be a better material to use for the commonly accepted type of family dwelling facilities.

Another factor is the type of weather or climate which affects the life of the people in the locality. Rains, strong winds and typhoons are governing weather features in many countries of the Asia/Pacific

Region. The Polynesian "FALE" is a typical shelter construction with tatched roof supported by strong timber posts, but without permanent walls or interior partitions. It is said that this type of construction allows strong winds (even of typhoon intensities) to blow through the "fale" without blowing it down to the ground. In rural areas of the Region which experience periodic floods, houses are usually built on concrete or stone stilts a few feet above the ground to keep the people and their belongings dry during flood time. Another instance where the prevailing climatic and weather conditions directly or indirectly affect the amount of wood used in housing and building construction is found in the Batanes islands north of Luzon (in the Philippines) which are visited by typhoons at least six times a year. In spite of the great availability of wood from the nearby province of Cagayan, almost all houses in the islands are built with stone wall and tatched roofs. Wood is sparingly used in the interior, for doors and furnishings of the "stone-houses".

Added to the above, other factors more technical in nature, participate to a great extent in the amount of wood used in buildings construction.

4.2 Some Common Practices in Housing And Buildings Construction

The following paragraphs describe, in a general way, the accepted and common practices in housing and building construction in major areas of the Asia/Pacific Region.

4.2.1 Southeast Asia

This area of the Asia/Pacific Region includes most of the developing countries which are timber-rich and have development programmes for more industrialization of their economies. These economic programmes have exposed the Southeast Asian Countries to the design and construction techniques of more advanced countries:

a) to build factory buildings;
b) to construct office buildings for the industrial and commercial firms that are established as a result of the industrialization activities; and

c) to erect mass housing projects for the manpower complement of the industry.

It is thus necessary to distinguish the housing and construction practices, in relation to the use of wood, with respect to the type of building or housing unit to be constructed, to wit:

a) Whether the building is for commercial or industrial purposes;
b) Whether the housing unit is for urban or ural areas; and
c) And for what income bracket is the housing project.

Government regulations on buildings construction has also become an accepted feature in most Southeast Asian countries. These regulatory and monitoring functions are geared to the enforcement of building codes --- another feature acquired from the advanced countries of the world. While wood is accepted as a standard building material in the building codes of most developing countries in the Asia/Pacific Region, the extent of its use in mass housing projects for the urban poor as reported in the 1985 Conference on Rural and Urban Development within ASEAN (Manila, 25-27 September 1985), is restricted by the insurance and banking conditions that cover the financial aspects of the project development. In short, the banks want to protect their exposure to the housing development project by requiring a minimum utilization life of 20-25 years and adequate insurance coverage for the housing units. The insurance companies, in turn, require strict compliance to the building codes of the country, which eventually leads to the need for more physical and structural characteristics of the building materials used to build the houses as part of their efforts to assure themselves that the houses will last for the minimum period required by the banks. Although a number of commonly known timber species in the area are included as one of the principal building materials in housing construction, the dwindling supply of traditional timber species has led to the use of what is now known as "Commercially-less-acceptable species" (CLAS). Unfortunately, almost all of the timber species in the CLAS group, for one reason or another, are not yet approved to be included in the building code.

This leads to less use of wood in the building construction industry of Southeast Asia.

4.2.2 The Pacific Island Countries

Wood as a housing material is accepted in most of the Pacific Island Countries. But it is less known in the form (sawn-timber) familiar to the more advanced developing countries of the Asia/Pacific Region. The most common use of wood in the rural areas of the Region is mainly for posts (roundwood form) and roofing structural or load-bearing members of the support, and as sticks to serve as the immediate support for light-weight roofing materials such as grass or palm leaves. In islands where construction timber is not available, imported sawn-timber, where structural and physical properties are usually known, are used for housing and buildings construction. In other islands, where indigenous timber species are available, the commonly accepted species are processed and used in the local buildings or furniture manufacturing industry, or are exported. In both cases, however, the use of more wood in housing and buildings construction, particularly in the urban centers of the islands, is constrained because of the lack of knowledge about the structural and physical properties of the timber species and the most efficient way of using the timber species in its various sizes available in the local timber market. The problem is compounded in the case of islands which were former colonies or were under the trusteeship of developed countries. Presumably, for convenience sake, the buildings code of the mother country is adopted by the Pacific island country. Or in the absence of formal building regulations in the island country, building inspectors are hired or sent from the mother country to monitor construction activities in the island country. More often that not, the building codes of the mother country become highly restrictive to the use of wood in housing and building construction, because the original bases and rationale for the formulation of the building code were quite different from those that exist in the island country.

Considering the low level of technological development in most of the Pacific Island countries, lack of adequate knowledge on the effective and economic use of indigenous timber species has also been a constant deterrent to the use of more wood in the housing in the Region.

Most, if not all, of the Pacific Island Countries have coconut tree plantations in sizeable areas of the island. Only a few of the islands have considered the use of coconut wood in housing and buildings construction. This is mainly due to their lack of adequate knowledge on how to saw the coconut tree stem into usable lumber form and, furthermore, they need to know the effective way of using coconut lumber in the various components of a housing or building structure. Although much has been done, during the decade, by the UNIDO and FAO, in developing the techniques of processing the coconut tree stem into coconut lumber and in determining the most effective way of using coconut lumber in low-cost house construction projects in the Philippines, there is still an urgent need to disseminate these information among the coconut-rich Pacific Island Countries.

4.2.3 Middle Latitudes Asia

The colder (middle latitude) countries of Asia present a very different picture in the use of wood in housing and buildings construction. The principal difference is in the insulation properties required of building materials as dictated by the low temperature levels that prevail during winter time. Timber is not well known and considered for its insulating properties. Thus the use of wood in the housing and buildings construction industry is restricted to interior walls, furnishings and furniture. Furthermore, in view of the prevailing low Equivalent Moisture Content (EMC) in those areas, the use of adequately seasoned wood becomes a necessity, to attain the desired level of stability of wood in use.

4.3 Constraints to the Wide Utilization of Wood in Housing and Buildings Construction

Among the international meetings that discussed this subject, the

Expert Group Meeting on Timber Construction (held in Vienna, 26, December 1985) has, more or less, crystalized and rationalized the factors that prevent the use of more wood in housing and building construction. In many ways, the Expert Group Meeting confirmed the findings of the Conference on Rural and Urban Development within ASEAN (referred to in previous sections of this paper). The major restraining factors, among others, are summarized as follows:

a) The need for identifying the wood species, determining its utilization characteristics (durability or service life, strength and machining characteristics) and disseminating these information to individuals, institutions or associations involved directly in the construction industry or in monitoring and enforcement of reputations on the use of wood;
b) Lack of adequate knowledge on the preservative treatment of CLAS or indigenous timber found in a number of developing countries in the Asia/Pacific Region;
c) Lack of "confidence" on timber as a construction material in view of the inconsistent standards of the quality of sawn timber processed by sawmills in the Region, leading to high costs and reluctance of designers to use wood;
d) The highly fragmented nature of the construction industry and the majority of small-scale building contractors make it almost an impossible task to formulate and install an effective monitoring and data-gathering system which are essential for a healthy growth of the industry. This situation is aggravated by the fact that in many of the developing countries of the Region decisions on construction policies and implementing rules and regulations are made by a number of government agencies, e.g. forestry, health, housing, public works, natural resources, agriculture, and defense, in one country.

4.4 Moves Encouraging More Use of Wood

Views on the matter were sought from construction industry leaders and government officials concerned with urban and rural development programmes of various developing countries of the Region. Their opinions, in general, coincide with the recommendations of the two

international conferences which touched on the use of more wood in housing and buildings construction. Among the major moves recommended to encourage more use of wood in the construction industry, the following are deemed deserving of immediate consideration and implementation:

4.4.1 Promotional Activities

The main barriers to more timber construction in developing countries have been identified as: "lack of tradition, lack of technical information and lack of industrial infrastructure". It was recommended that the solution to the problem be approached as both short and a long-term basis. It is believed that more vigorous promotional activities should be directed towards policy-makers, aiming to convince them of the benefits to be derived from the implementation of complete package projects, instead of selective and "piece-meal" government action to assist the industry in specific areas. The long-term aspect of the solution calls for formulation and immediate implementation of programmes to educate the general public and the pertinent public officials on the proper utilization of wood as a building material. It was deemed that the long-term promotional activities will stand a better chance of success if the services and/or facilities of "timber technology centres, wood-loving architects and engineers, timber design societies and universities" are availed of.

The publication of manuals to promote timber construction was recommended: one for the engineers, describing how to design structures with wood, and another for the technicians who are expected to translate such structure designs in terms of details for fabrication. (Publication of the manuals in the language readily understood by the readers in the developing country where it is going to be used).

It is also believed that construction of proto-type houses making extensive use of timber as a construction material will contribute to better chances of success for the promo-

tional activities to be implemented.

Aside from local timber construction centres, it was suggested that their activities be re-inforced, more vigorously, by local research institutes by way of engaging in more industry-oriented research projects.

It was also suggested that publication of picture books on wood construction, (with captions in the local language) will also help promote wood construction.

4.2.2 Technical Aspects of the Solution

Forest research institutions in many developing countries of the Asia/Pacific Region have done ample work to identify CLAS timber and their physical and processing characteristics. However, more often that not, there is very little dissemination of these information and technical data to the people in the general public who have valuable use of the data in the conduct of their construction activities.

Steps should therefore be taken to distribute these data to the construction industry people, and, if possible, reduce the data to a form which could be readily understood by the general public.

The proper choice and effective use of timber preservatives, finishing materials systems and painting techniques should be studied more intensively so that the banking and insurance requirements for desired lengths of service life of timber used in construction be adequately complied with. Results of experiments in this direction should be furnished the pertinent sectors of the banking and insurance communities.

The quest for substitutes chosen from indigenous timber species to replace the dwindling supply of traditional timber species should be pursued with more vigor. The results of such activities should also be made known to the non-technical sector of the nation's economy w-ich are involved in or have a large influence on the success of construction projects using wood as a principal material.

V - REGIONAL AND NATIONAL INDUSTRY AND TRADE ASSOCIATIONS

5.1 The Need for Regional and National Industry and Trade Associations

Industry development programmes, particularly the development of the construction industry towards more use of timber, stand a better chance of success, if the persons, entities or firms affected by the programme are consulted during the formulation and rationalization stage of the programme, for in this manner, their cooperation is better assured during the implementation of the programme as they are made part and parcel of the programme. Industry and trade associations involved in the processing and utilization of wood exist in Asia, both at regional and national levels. However, this is not true with the Pacific Island Countries. Professional and business associations concerned with the use of wood in construction are found all over the Asia/Pacific Region. On the other hand, the functions and activities of such associations in centrally-planned economies of Asia are exercised by government institutions and agencies, including leading officials of para-statal wood processing firms.

5.2 Regional Industry and Trade Associations

The Southeast Asian Log Producers Association (SEALPA) still exercises a major role in the log and timber trade of the Region.

The Asian Panel Products Federation (APPF) covers the interests of plywood and other wood-based panel producers of Asia. The interests of the secondary wood processing industry in the Region is covered by two regional associations: The ASEAN Federation of Furniture Manufacturers (AFPMA), whose membership is limited to furniture and woodworks manufacturer of the ASEAN countries, and the Asian Federation of Furniture Industries Association (AFFIA), which accepts members from both the manufacturing and trading sectors of the furniture and woodworks industry of Asia. The Presidency of these organizations are held on a rotation basis, so that their offices are located in the country where the President resides.

The AFFMA has been successful in staging annual furniture fairs at various capital cities of the ASEAN nations.

Unfortunately, the Pacific Island countries do not have corresponding associations at regional level.

5.3 National Trade and Industry Associations

Complementary to the regional industry and trade associations, there exist counterpart organizations at national levels among many developing countries in Asia. These national associations, aside from representing the industry's interests in dialogues with the government and other private agencies or professional associations, take a major part in regional activities by sponsoring the furniture fair when their turns come around. Among the more known and active national associations are:

a) The Philippine Wood Products Association, Makati, Metro Manila;

b) The Chamber of Furniture Industries of the Philippines, Pasig, Metro Manila;

c) I.S.A. (Indonesian Sawmillers Association), Jakarta, Indonesia;

d) APKINDO (Association of Plywood Manufacturers), Jakarta, Indonesia;

e) The Furniture and Woodworks Manufacturers Association of Indonesia, Jakarta, Indonesia;

f) The PNG Forest Industries Association, Port Moresby, PNG;

g) The Singapore Furniture Manufacturers Associations, Singapore;

h) The Thai Furniture and Woodworks Manufacturers Association, Bangkok, Thailand; and

i) The Federation of Furniture and Woodworks Manufacturers of Malaysia, Kuala Lumpur, Malaysia.

The trade and industry associations of the Philippines, Indonesia, Thailand and Malaysia, contributed greatly to their respective country's decision to adopt measures banning or restricting the export of logs, sawn-timber, rattan poles and semi-processed raw rattan items.

VI - INDUSTRY SERVICE AGENCIES

6.1 General Consideration

Complementary to the existence and active cooperation of industry and trade associations, the availability of service agencies is highly instrumental to the successful implementation of any development programme for the secondary wood processing industry of ASIA/PACIFIC developing countries. In fact, the sub-project for the encouragement, and direct assistance, if needed, to these service agencies should be made an integral part of the over-all development programme.

It is quite often the case that one such agency is expected to serve industry in general, so that efficacy of the services delivered is throttled down to almost useless levels. It is thus required that such agencies be geared to serve the secondary wood processing industry alone and if the needs of the industry have been fully met and still more service hours are available, it should be used for industries allied to or supporting the secondary wood processing industry. The industry service agencies which deserve assistance, either from the government or private sector, are: a) training institutions for industry personnel; b) furniture design services; c) furniture quality testing services; d) product standards agencies; and, e) construction materials standards and testing services.

6.2 Industry Personnel Training Institutions

Only a few truly industry-oriented institutions for training industry personnel of the secondary wood industry exist/operate in developing countries of the Region. Most of the existing training institutions are geared to train students along some kind of craft so that they are assured of a trade or means of livelihood after completing the courses offered by the institutions. The same people, when hired by industry takes many months, even years, to be effective workers. Among the more well-known and truly industry-oriented institutions in the Region are: a) the "PENDIDIKAN INSTITUT KAYU ATAS" (PIKA), or the Institute for Woodworking Industry Training in

Semarang, Java, Indonesia, and b) the NACIDA Furniture and Woodworks Training Center in Marikina, Rizal Province, Philippines. The training facilities of these institutions are so limited that they can only produce barely 10% of the industry demands for skilled and highly skilled labors from the growing secondary wood processing industries of their respective countries. Nevertheless, it will be worthwhile for governments contemplating to establish and operate similar training institutions to evaluate the possibility of adapting their course of studies and training techniques. Visits to a number of vocational and trade schools in developing countries of the Region brought out the fact that these schools have the basic woodworking equipment for industrial operations. What is needed is the revision of their course of studies to make them more industry-oriented and re-train their training staff in more industry-oriented operations. In this manner, it is possible to meet a good portion of the increasing industry demand for skilled and highly skilled laborer, through the existing training facilities in the country.

6.3 Furniture Design Services

One of the conditions for furniture products from Asia/Pacific developing countries to be competetive in the international market is for their design/s to be acceptable to foreign buyers. Lack of adequately-trained and experienced designers is a very common handicap of the furniture/joinery industry in developing countries of the Region. Since this "know-how" could be obtained only from foreign sources, the small and medium-scale furniture/joinery producers usually do not have the financial capability to hire those services. This is an area where governments could help themselves in their efforts to increase the development pace of their secondary wood processing industries by assisting the industry in their efforts to avail of foreign design services.

Singapore has hired Hongkong furniture designers to assist the local industry in solving their design problems. The Philippines established, on its own, the Philippine Design Center (PDC) which provides, free of charge, advice on the design and product development acti-

vities of the furniture industry in the country. Design and product development "know-how" are kept up-to-date by inviting foreign experts on limited technical assistance missions to the PDC. The Furniture Development Centre of the Industrial Services Institute in Bangkok, Thailand, dispenses similar technical assistance to the furniture and joinery industry of the country.

Governments of other developing countries in the Region could learn a lot from the experience of the above-described service agencies in Singapore, the Philippines and Thailand.

6.4 Furniture Quality Testing Centre

Efforts to keep the quality level of secondary wood products manufactured in the Region's developing countries are better complemented with the availability of testing facilities. Only a few of the developing countries of the Region have adequate type of furniture testing facilities. The most experienced among the Region's developing countries would be Thailand which installed furniture testing facilities in Bangkok about 10 years ago with financial and technical assistance from the Japanese Industrial Cooperation Agency (JICA). More recently, the Philippines was assisted by the Japanese government (thru JETRO) in establishing a furniture testing center in Manila. Also, about three years ago, the Forest Research Institute of Malaysia in Kepong, Kuala Lumpur, set up its own furniture testing and development services, in line with the country's efforts to encourage faster development of its secondary wood processing industry.

There is no doubt that the Industrial Service Institute of Thailand played an important role in helping the country's export-oriented wooden furniture industry to attain export volume levels it is now enjoying.

Again, the developing countries of the Asia/Pacific Region can learn greatly from the experience of Thailan's furniture testing center.

6.5 Product Standards Agencies

A number of governments of developing countries in the Asia/Pacific

Region (e.g., Thailand and the Philippines) have established agencies which are charged with the responsibilities of setting up quality standards for major products of the country, particularly those which earn huge amount of foreign currencies for the developing country. At this point in time, however, there are several sets of standards set and imposed by furniture manufacturing countries in Europe and the USA, which are not exactly the same in particulars. In its efforts to reconcile most of the existing quality standards for products sold in the international market, the International Standards Organization (ISO), a U.N. supported agency, has lately developed a tentative set of standards for furniture and joinery products. The ISO standards are still considered in the development stage and only some countries have fully subscribed to and are using the ISO standards. There is no reason why a developing country in the Region can not set up its own standards for furniture products, provided it has the finances and properly trained personnel to do so. Otherwise, it would be wise to conform to the I.S.O. standards rather than have no furniture products standards at all.

6.6 Construction Materials Standards and Testing Agencies

One of the major recommendations in both conferences on timber construction and rural and urban development (mentioned in previous chapters of this paper), is the setting up and monitoring of standards for construction materials. The monitoring aspects of the recommendation requires the establishment of testing centres for construction materials. Most of the developing countries in the Region have such testing centres, but most of them operate in connection with monitoring activities for public works projects. Some of these testing centres (in the Philippines, Thailand, Indonesia, India and Malaysia, for example) provide limited testing services to the private sector. Efforts to promote more use of wood in construction may be helped by making existing materials testing facilities more accessible to the construction industry or establishing additional centres in strategically located areas of the country.

VII - SUPPORT ACTIVITIES TO SUSTAIN GROWTH OF THE INDUSTRY

7.1 General Considerations

The continued growth of the secondary wood processing industry of the developing countries in the Asia/Pacific Region can be better sustained at the desired rate if support activities are also kept moving abreast in order to: a) assure the industry of adequately-trained labour at the time needed; b) provide the industry with up-dated product designs, manufacturing techniques and product packaging systems which properly respond to the changing needs of the market; c) encourage the development of the local machinery and equipment fabrication industry to help keep costs of expansion and future operations at reasonably lower levels; and d) create that kind of investment atmosphere which will encourage capital generation to finance industry growth, together with the needed industry service agencies and support activities.

7.2 Manpower for the Industry

Initial stages of the development programme for the industry should also include the training of trainors for key personnel of the growing industry, in addition to actual training of industry manpower. The training programme, to effectively support industry growth, should provide the basic skills, through industry-oriented training courses, which the industry need, such as: woodworking millrights, machine operators, finishing technicians, product engineers, industrial mechanics and electricians. These skilled, highly-skilled and technical manpower should be trained in sufficient numbers to adequately meet the growing needs of the industry. It is expected that foreign assistance will be needed (in most of the Region's developing countries) in the initial phase of the training programme. Some of the foreign experts may be drawn from the ranks of highly experienced and capable men of the more advanced developing countries in the Region under some form of arrangement for technical cooperation among developing countries.

If necessary, existing training facilities for industrial labour should be up-dated and expanded to meet the requirements of the training programme.

7.3 Industry Research and Development Activities

The growth of woodworking industries of the West was made possible with ample support from the research and development sector of both industry and the country. This ingredient to industry development is greatly needed to sustain the export-oriented growth of the secondary wood processing industry of the Region. The areas for major thrust of research and development activities should cover the following aspects of the industry: a) product designs which are responsive to the changing tastes of the market; b) manufacturing techniques which will help cut product costs for the newly designed products with the desired quality level and in quantities that meet market demands; and, c) improvement of locally fabricated woodworking machinery and equipment to increase their precision and outputs.

7.4 Locally Fabricated Machinery and Equipment

A number of the developing countries in the Region have existing industries that fabricate machinery and equipment for the woodworking industry. Kiln-drying equipment are now being manufactured in Singapore and Indonesia. Some basic woodworking machines, such as bandsaws, planers, radial arm saws, vertical spindle moulders and drill presses of acceptable specifications have been manufactured for the past 5 to 10 years in the Philippines, Malaysia, Thailand and Singapore. Periodic visits to some of these factories indicate marked improvement in the quality of the locally fabricated machines during the last 3 years. It will be a healthy move to provide the industry with enough incentives or motivation to help them grow abreast of the secondary wood processing industry of the Region.

7.5 Investment Atmosphere

Capital is the fuel that propels the growth of industries. This

maxim certainly applies to the wood processing industry of the Asia/ Pacific Region.

Unfortunately, many of the developing countries in the Region do not have the financial resources to initiate, or even support, the accelerated growth intended for their secondary wood processing industries. A number of Asia/Pacific developing countries have existing laws designed to attract foreign capital. Some of them have even included features that encourage local investors to invest in new or selected industries. It may be a healthy move to examine the existing investment laws and, if needed, up-date or revise them to make them more responsive to the increasing capital needs of the secondary wood processing industry of the Region. During the initial growing stages of industry in some of the developed countries, incentives were given to these firms in related industries which engaged in activities to help themselves. This could be another tool to help industry find the capital needed to keep it growing at the desired pace of development.

VIII - CONCLUSIONS AND RECOMMENDATIONS

The current constraints to a desirable rate of growth and development of the wood processing industry of the Asia/Pacific Region, particularly the secondary wood processing sector, are not very different from those identifed during the First Global Consultation on the Wood and Wood Products Industry in 1983. The prevailing situation, however, requires more intensity and dispatch in the formulation and implementation of remedial actions in view of the recent shift in policies of timber-rich developing countries of the Region to engage in more vigorous downstream timber processing. The major problems that need to be addressed with priority and resolve are summarized below. Corresponding solutions are also indicated.

8.1 Industry Manpower Resources Problem

The industry is in great need of adequately trained factory personnel at all levels of operations (middle management and floor supervision, technical support staff and machine operators). On the basis of industry development programmes established by the major timber-processing countries of the Region, the demand for adequately trained manpower can be safely estimated to be at least twice the demand foreseen during the First Consultation. The existing skills training facilities for the industry cannot produce enough trained people in time to meet the increasing demands of the industry. To start with, these training institutions do not have enough trainors to cope with the required volume of training activities.

8.1.1 Indicated Remedial Action

The following immediate moves are indicated:

a) Up-date the training facilities and expand the training staff of existing institutions and provide them with adequate financial and technical assistance to enable them to operate at maximum capacities;

b) Arrangements be made to avail of the services of foreign experts to train selected groups of trainors in each developing country participating in the programme;

c) Establishment of branches of training institutions in selected locations more accessible to industry; and

d) Arrange with existing international-oriented agencies to act as catalysts for the training programme.

8.2 Raw Materials Supply Problem

The next major constraint to the desired industry development in some of the developing countries of the region is the impending lack of raw materials due to the depleted resources of traditional timber species. The problem is compounded for timber-deficit countries of the Region in view of the recent moves of neighboring timber-rich countries banning or severely restricting the export of normal logs and sawn-timber.

8.2.1 Indicated Remedial Action

The following immediate moves are indicated to be pursued with more vigor and resolve:

a) Acceleration of research work on the evaluation of availability and wood processing potentials of "Commercially-Less-Acceptable Species" (CLAS) timber and the wide dissemination of the results among the wood processing industry and other sectors of the economy which would find good use of such information;

b) Up-dating of industry standards and specifications to allow the use of the CLAS timber in the manufacture of furniture and joinery products;

c) Review and revise national building codes to include the use of CLAS timbers in housing and buildings construction; and

d) Adopt some form of standard framing construction, patterned or based on the Australian standard framing system, which will allow more use of CLAS timber.

8.3 Basic and Applied Research for the Industry

Most of the Asia/Pacific developing countries possess ample resources of indigenous raw materials for both the secondary wood processing and the construction industries, yet, for a number of reasons, principal of which is lack of adequate financial support, the potential materials for industry are not exploited properly.

8.3.1 Indicated Remedial Action

Adequate funds should be provided the research and development institutions engaged in the evaluation and development of indigenous materials for the use of the wood processing industry. Large-scale wood processing and construction firms could be called upon to join the government's efforts in providing adequate funds to support the research and development activities. This may be done through the private sector's sponsorship of specific research and development projects of its choice. The up-dating of the facilities for research and development institutions engaged in industry-oriented activities, should, of course, be adequately funded and immediately carried-out to assure continuity and progress in more advanced research and development activities.

8.4 More Advanced Technology

Current production techniques in developing countries of the Region need periodic up-grading in order for the industry to meet adequately the expected increasing demands for housing units and furniture/joinery products in both domestic and foreign markets. Developed countries with extensive wood processing industries are the current principal sources for the needed technical "know-how".

8.4.1 Indicated Remedial Action

The most common and least costly method of bringing new or more advanced technology to industry in developing countries is through cooperative arrangements between manufacturing and/or marketing firms in the countries which possess the

desired technology and the wood processing firms in the developing countries, Thus, the developing country will help itself by reviewing its laws and regulatory policies on the matter with a view to making it more attractice and practical for foreign firms to bring in technical "know-how" under some form of joint-venture arrangement.

Another method of acquiring new technical "know-how" is through participation in regional or international conferences, seminars, workshops or study tours sponsored by pertinent agencies of developed counrtries (such as U.S. Aid, CIDA, JICA or JETRO, FINNIDA, etc.) or the U.N. The developing country will therefore be helping itself by sending participants who: a) are sufficiently prepared to assimilate the knowledge that will be dispensed in such gatherings, and b) are in a position to effectively disseminate the acquired knowledge to sectors of the industry in his country which will benefit most from the application of the newly acquired technical "know-how".

8.5 Financial Assistance for Development Programmes

The success of industry development programmesis of course heavily dependent on the availability of adequate funds at the time they are needed. Funding requirements usually require a sizeable portion of foreign currency expenditures. Unfortunately, most, if not all of the developing countries in the Asia/Pacific Region are currently short of foreign currency resources. Thus, the foreign currency requirements of the industry development programme are most usually available in the form of foreign loans (normally requiring the country's guarantee if drawn by private entities) and/or funds from foreign financial assistance programmes allocated for industrial development purposes in chosen developing or under-developed countries. Another form of fund sourcing is thru equity participation of foreign firms in local firms which need foreign currency for expansion or development purposes. In some countries of the Asia/Pacific Region, however, existing laws and/or regulations on monetary and investment matters make it difficult for foreign investors to invest in the country.

8.5.1 Indicated Remedial Action

One of the most common shortcomings in the formulation of industry development plans is the miscalculation of the funding requirements of the programme. This is further compounded by the fact that there are usually several sectors of the developing country's economy which have also been committed for funding. It is therefore necessary that more intensive studies be done to ascertain more accurately the financial requirements for the development of the wood processing industry and relate these to the country's over-all funding commitments for economic development. It is further required that systems be set up to assure the availability of adequate funds, once the project is started.

In addition, the investment laws of the developing country should be reviewed, and if necessary, revised to foster a fair and just working arrangement for foreign investors. In particular, the matter of remitting profits and capital back to the foreign firms country, deserve a more detailed study and justifiable revision, for this problem has been the most common reason for the reluctance of foreign firms to invest in developing countries, not only in the Asia/Pacific Region, but all-over the world.

8.6 Regional Economic Cooperation

The remedial actions discussed in the preceding paragraphs present a number of possibilities for applying the concept of economic cooperation between developing countries (ECDC) of the Region. In fact, because of the wide range of stages in technological development among the developing countries in the Region, it is highly possible that some form of technical cooperation among the developing countries (TCDC) may be formulated whereby the wood processing technical "know-how" required by the less-developed countries of the Region could be supplied by the better developed timber processing countries (e.g., Thailand, the Philippines, Malaysia, Indonesia, India or China). Some examples of ECDC or TCDC as applied to the wood processing

industry of the ASIA/PACIFIC Region are described in the following paragraphs:

8.6.1 Training of Manpower for the Industry

Arrangements among countries involved should be made to facilitate training of foreign recruits in the revitalized training institutions with the object of providing "Trainers" for the beneficiary country, and possibly, skilled workers and trained management and technical staff personnel for the immediate needs of both the beneficiary and host country.

8.6.2 Timber Supply Arrangements

Special arrangements with "Timber-Surplus" countries for the supply of roundwood in exchange for other reaw materials, technical-know-how or resources which the Timber Deficit country is in a position to share with the other countries.

8.6.3 Research & Development Activities

Steps should be taken by the countries concerned for a much closer cooperation in the field of research and development (particularly in the applied sector of the endeavor). Concurrently, an equitable and feasible method of sharing the knowledge thus gained should be developed among the countries' institutions or private entities participating in the cooperative research and development venture.

More situations exist which may lead to the more extensive use of ECDC or TCDC in the Asia/Pacific Region, but they require extra efforts to be identified.

B I B L I O G R A P H Y

ATTC BRIQUETTING, Waste Utilization, The ASEAN Timberlink, Vol.2 No. 11, Nov. 1989, Kuala Lumpur, 1989.

Bergado, D. T. FOUNDATION PRACTICES IN METRO MANILA AND VIBRATION MEASUREMENTS DURING PILE DRIVING AT THE SILOM PALACE CONDOMINIUM BANGKOK, Proceeding of the Conference on Rural and Urban Development within Asean, ASEAN Federation of Engineering Organizations, Manila, Sept. 25-27, 1985.

Brion, H. P. ASSISTANCE IN THE QUALITY AND IMPROVEMENT OF FURNITURE INDUSTRIES IN WESTERN SAMOA, Interim Report, Phase One, UNIDO Proj. No. SI/SAM/88/801, Vienna, 1989.

ASSISTANCE TO THE FURNITURE AND JOINERY INDUSTRY, The Kingdom of Tonga, UNIDO DP/ID SER.B/617, Vienna, 1988.

ASSISTANCE TO THE WOOD PROCESSING INDUSTRY OF THE SOLOMON ISLANDS, Terminal Report, UNIDO, DP/ID/SER.B/569, Vienna, 1987.

A STUDY OF POTENTIALS FOR DOWNSTREAM TIMBER PROCESSING IN DEVELOPING COUNTRIES OF THE ASIA/PACIFIC REGION, UNIDO Proj. No. DU/RAS/86/048, Vienna, 1989.

CURRENT STATUS AND FUTURE DEVELOPMENT OF THE SECONDARY WOOD PROCESSING INDUSTRY OF DEVELOPING COUNTRIES, UNIDO, ID/WG.395/4, Vienna, 1983.

DEMONSTRATION OF COCONUT WOOD UTILIZATION IN LOW COST HOUSING, UNIDO, DP/ID/SER.B/484, Vienna, 1984.

DEVELOPMENT OF SECONDARY PROCESSING IN THE WOOD AND WOOD PRODUCTS INDUSTRY OF DEVELOPING COUNTRIES, Preparatory Document First Consultation on Wood and Wood Products Industry, UNIDO ID/WG.387/5, Vienna, 1983.

MANUAL ON DOCUMENTATION AND INFORMATION SYSTEMS FOR FURNITURE AND JOINERY PLANTS IN DEVELOPING COUNTRIES, UNIDO, ID/315, New York, 1950.

ON THE DEVELOPMENT OF THE SECONDARY WOOD PROCESSING INDUSTRIES IN DEVELOPING COUNTRIES OF ASIA AND THE PACIFIC, FAO, FO: RAS/78/010, Mission Report No.3, APPIDG, Kuala Lumpur, 1986.

Brion, H. P. POTENTIALS AND REQUIREMENTS OF INCREASING THE DEGREE OF WOOD PROCESSING IN DEVELOPING COUNTRIES OF ASIA AND THE PACIFIC, UNIDO/IS.395, Vienna, 1983.

REGIONAL SITUATION PAPER: THE WOOD AND WOOD PRODUCTS INDUSTRY OF ASIA, ITS CURRENT STATUS (1981 - 1982) AND FUTURE DEVELOPMENT, UNIDO ID/WG.387/1, Vienna, 1982.

TECHNICAL ASSISTANCE FOR THE DEVELOPMENT OF THE FURNITURE AND JOINERY INDUSTRIES OF WESTERN SAMOA, UNIDO Proj. No. DP/RAS/86/075, Vienna, 1988.

TECHNICAL ASSISTANCE TO THE FURNITURE AND JOINERY INDUSTRIES OF THE REPUBLIC OF THE MARSHALL ISLANDS, UNIDO DU/RAS/86/075, 1988.

TECHNICAL ASSISTANCE TO THE WOOD PROCESSING INDUSTRIES OF THE FEDERATED STATES OF MICRONESIA, UNIDO DU/RAS/86/075, Vienna, 1988.

Caliwara, C. A. COCONUT WOOD UTILIZATION IN LOW COST HOUSING, Proceeding of the Conference on Rural and Urban Development within Asean, ASEAN Federation of Engineering Organizations, Manila, Sept. 25-27, 1985.

Canela, E. Q. PRODUCTION MANAGEMENT FOR SMALL-AND MEDIUM-SCALE FURNITURE MANUFACTURING FIRMS IN DEVELOPING COUNTRIES, UNIDO ID/300, New York, 1983.

Casin, R. F., Tamayo, et.al. DESIGN AND CONSTRUCTION OF A FURNACE-TYPE LUMBER DRY KILN, NSDB-Ford Assisted Project No. 7602, FORPRIDECOM College, Laguna, Philippines, 1983.

FAO FORESTRY STATISTICS, Asia-Pacific Region, Report & Papers of FAO Seminar, 3 - 7 December, 1984, Bangkok, Thailand, RAPA, Bangkok, 1985.

MONTHLY BULLETIN, TROPICAL FOREST PRODUCTS IN WORLD TIMBER TRADE, FO: MISC/89/3, Rome, 1989.

PROFILE OF THE WOOD PROCESSING INDUSTRY, W.P.I.S.S. INDONESIA - BASE SURVEY (Vol. IV), FAO, Rome, 1987.

TROPICAL FOREST RESOURCES ASSESSMENT PROJECT - FOREST RESOURCES OF TROPICAL ASIA, Food and Agriculture Organization of the United Nations, Rome, 1981.

WOOD PROCESSING INDUSTRY SECTOR STUDY INDONESIA, MAIN REPORT, FAO, Rome, 1987.

WORLD PRODUCTION CAPACITIES: PLYWOOD, PARTICLE BOARD AND FIBREBOARD, FAO Committee on Wood-Based Panel Products, Rome, 1980.

YEARBOOK OF FOREST PRODUCTS, 1976-1987, Rome, 1989.

F.S. of MALAYSIA FORESTRY IN MALAYSIA, AN EXERCISE ON BALANCED LAND-USE, Ministry of Primary Industries, Malaysia, Kuala Lumpur, 1988.

Ferrer, L. M. HOUSING STANDARDIZATION IN THE PHILIPPINES, Proceeding of the Conference on Rural and Urban Development within Asean, ASEAN Federation of Engineering Organizations, Manila, Sept. 25-27, 1985.

Gan, R. RURAL AND URBAN HOUSING IN MALAYSIA, Proceedings of the Conference on Rural and Urban Development within Asean, ASEAN Federation of Engineering Organizations, Manila, Sept. 25-27, 1985.

Hansom, O. P. OVERALL VIEW OF THE PROBLEMS CONNECTED WITH THE PROMOTION OF COMMERCIALLY LESS ACCEPTED SPECIES, Global Preparatory Meeting For The First Consultation on the Wood and Wood Products Industry, UNIDO ID/WG.387/3, Vienna, January 24-26, 1983.

Haslett, A. N. PROPERTIES AND USES OF THE TIMBERS OF WESTERN SAMOA, Forest Research Institute, New Zealand Forest Service, Rotorua, New Zealand, 1986.

Herlianto THE ROLE OF INFORMAL SECTOR IN HOUSING AND URBAN DEVELOPMENT IN INDONESIA, Proceedings of the Conference on Rural and Urban Development within Asean, ASEAN Federation of Engineering Organizations, Manila, Sept. 25-27, 1985.

Hong, L. T. RUBBERWOOD PROCESSING AND UTILIZATION, Forest Research Institute of Malaysia, Kepong, 1985.

Jahidul Alum, A. K. M. LOW COST STRUCTURE OF RURAL AREAS IN THE ASEAN REGION, Proceedings of the Conference on Rural and Urban Development within Asean, ASEAN Federation of Engineering Organizations, Manila, Sept. 25-27, 1985.

Kininmonth, J. A. PROPERTIES AND USES OF TIMBERS OF WESTERN SAMOA, Forest Research Institute, Rotorua, New Zealand, 1982.

Knight, E. KILN-DRYING WESTERN SOFTWOOD, Moore Dry-Kiln Company of Oregon, North Portland, Oregon, 1970.

Lew, W. H. THE WOOD AND WOOD PRODUCTS INDUSTRY IN PENINSULAR MALAYSIA, Malaysian Timber Industry Board, Kuala Lumpur, 1982.

Moavenzadeh, F. MEASURES AND ACTIONS TO INCREASE THE PRODUCTION OF INDIGENOUS BUILDING MATERIALS IN THE CONTEXT OF ENHANCED IMPORT SUBSTITUTION, Meeting for the First Consultation on the Building Materials Industry, UNIDO ID/WG.425/3, Vienna, Sept. 24-28, 1984.

Narong, T. FORESTRY AND FOREST INDUSTRIES IN THAILAND, Asia Pacific Forest Industries, Safan Publishing Sdn. Bhd., Kuala Lumpur, Dec., 1988.

Ooi, S. H. DEVELOPMENT STRATEGIES FOR THE RUBBERWOOD PROCESSING INDUSTRIES, MIDA, Kuala Lumpur, 1985.

Paavola, et.al. FURNITURE AND JOINERY INDUSTRIES FOR DEVELOPING COUNTRIES, UNIDO ID/108/Rev.1, New York, 1981.

PIKA Brochure on "Pendidikan Industri Kayu Atas (Institute for Woodworking Industry Training), Semarang, 1989.

PNG COMPENDIUM of STATISTICS, 1986, Department of Forests, PNG, Boroko, 1989.

FACTS & FIGURES, 1986, Dept. of Forests, PNG, Boroko, 1989.

INVESTMENT POTENTIALS IN FORESTRY, PROBLEMS AND PROSPECTS, Dept. of Forests, PNG, Port Moresby, 1987.

PNG-FIA TOWARDS A FOREST POLICY, Forest Industries Association of Papua-New Guinea, Port Moresby, 1989.

Razak, Abd. O. & Supardi, et.al. THE FEASIBILITY OF RATTAN PLANTING, Forest Research Institute of Malaysia, Kepong, 1986.

Salleh, M. N. THE POTENTIAL FOR MINOR FOREST PRODUCTS, Forest Research Institute of Malaysia, Kepong, 1987.

Salleh, M. N. & Aminuddin, B. M. RATTAN AS A SUPPLEMENTARY CROP IN RUBBER PLANTATIONS, Forest Research Institute of Malaysia, Kepong, 1986.

Salleh, M. N. & Ghazali, B. H. FORESTRY IN THE TROPICS - A PRODUCER'S VIEWPOINT, Forestry Department, Kuala Lumpur, 1980.

Sebestyean, G. RESEARCH PRIORITIES FOR THE BUILDING MATERIALS INDUSTRIES IN DEVELOPING COUNTRIES, Global Preparatory Meeting for the First Consultation on the Building Materials Industry, UNIDO ID/WG.425/1, Vienna, Sep. 24-28, 1984.

S. I. C. Brochure on "FURNITURE VILLAGE, OLAH LIMPIT, Banting Selangor Darul Eshan, Malaysia", Selangor Industrial Corporation, Petaling Jaya, 1989.

Tagudar, E. & Sta. Ana, R. L. WOOD INDUSTRY OF THE PHILIPPINES FACING AN UNCERTAIN FUTURE, Asia Pacific Forest Industries, Safan Publishing Sdn. Bhd., Kuala Lumpur, Jan. 1989.

Thang, H. C. AN UPDATE OF THE STUDY ON ASEAN PULP AND PAPER INDUSTRIES, FAO, Rome, 1988.

UNIDO/MIDA MEDIUM AND LONG TERM INDUSTRIAL MASTER PLAN MALAYSIA, WOOD-BASED INDUSTRY, 1986-1995, Vol.II, Part 4, Kuala Lumpur, 1985.

UNIDO REPORT EXPERT GROUP MEETING ON TIMBER CONSTRUCTION, ID/WG. 447/17, Vienna, 27 May 1986.

REPORT: FIRST CONSULTATION ON THE WOOD AND WOOD PRODUCTS INDUSTRY, Helsinki, Finland, 19-23 September 1983, UNIDO ID/306 (ID/WG.395/10), Vienna, 1983.

REPORT: GLOBAL PREPARATORY MEETING FOR THE FIRST CONSULTATION ON THE BUILDING MATERIALS INDUSTRY, ID/WG.425/7, Vienna, Oct. 9, 1984.

REPORT: GLOBAL PREPARATORY MEETING FOR THE FIRST CONSULTATION ON THE WOOD AND WOOD PRODUCTS INDUSTRY, ID/WG.387/10, Vienna, Feb. 14, 1983.

_____ ANNUAL REPORT, Fiji Pine Commission, Fiji, 1988.

_____ ANNUAL REPORT, Forestry Department, Fiji, 1988.

_____ ASAU PORT AGRICULTURAL AND INDUSTRIAL DEVELOPMENT STUDY, Feasibility Report, Vol. 1 G. Australia, et.al., 1986.

_____ ASEAN FOCUS, INDONESIA-ACCELERATING VALUE ADDED PROCESSING, Asia Pacific Forest Industries, Safan Publishing Sdn Bhd, Kuala Lumpur, September 1989.

_____ BAMBOO TECHNOLOGY, A Reference Manual, Philippine Human Resources Development Center (PHRDC), Manila, 1987.

_____ BEIJING TIMBER FACTORY, Beijing Guanghua Wood Processing Factory, Beijing, 1965.

_____ BUILDING PRODUCTS UNIVIC MACHINERY OPENING THE DOOR TO MODERN TECHNOLOGY FOR CHINESE MANUFACTURERS, Asia Pacific Forest Industries, Safan Publishing Sdn Bhd, Kuala Lumpur, July 1989.

_____ COUNTRY PROFILE: FIJI - A NEW PATH TO FOLLOW, Asia Pacific Forest Industries, Safan Publishing Sdn Bhd, Kuala Lumpur, October 1989.

_____ COUNTRY PROFILE: HONGKONG - FURNITURE INDUSTRY - WORKING AROUND THEIR PROBLEMS, Asia Pacific Forest Industries, Safan Publishing Sdn Bhd, Kuala Lumpur, July 1989.

_____ COUNTRY PROFILE: INDIA - FACING A BLEAK FUTURE, Asia Pacific Industries, Safan Publishing Sdn Bhd, Kuala Lumpur, June 1989.

_____ COUNTRY PROFILE: SINGAPORE - TIMBER TRADE REFUSES TO DIE, Asia Pacific Forest Industries, Safan Publishing Sdn Bhd, Kuala Lumpur, Feb. 1989.

_____ DOWEL JOINTS FOR FURNITURE, The ASEAN Timberlink, The Asean Timber Technology Centre (ATTC), Kuala Lumpur, 1989.

_____ FASTEST GROWING MARKER IN THE WORLD - CHINA, THE, The ASEAN Timberlink, The ASEAN Timber Technology Centre (ATTC), Kuala Lumpur, 1989.

_____ FIJI MASTER BUILDER, Fiji Master Builder's Association, (Inc.), Suva, Fiji, 1984.

_____ FURNITURE EXPORT PRODUCTION BUILDING A REPUTATION, Asia Pacific Industries, Safan Publishing Sdn Bhd, Kuala Lumpur, October 1989.

_____ FURNITURE: INTEGRATED OPERATION THE ASIAN "GIANTS", Asia Pacific Forest Industries, Safan Publishing Sdn Bhd, Kuala Lumpur, September 1989.

_____ FURNITURE: SINGAPORE - Industry in Transition, Asia Pacific Forest Industries, Safan Publishing Sdn Bhd., Kuala Lumpur, October 1989.

_____ INFORMATION HANDBOOK, Fiji Pine Commission, Fiji, 1976.

_____ INVESTMENT OPPORTUNITIES, FACILITIES AND INCENTIVES IN THE AGRO-BASED INDUSTRY IN JOHOR TENGGARA (KEJORA), Kejora Management Services Sdn. Bhd., Desaru 1987.

_____ KRAFTMAN TAHUNAN, 1986, KETENGAH Report, Central Tengganu Development Authority, Kuala Lumpur, 1987.

_____ LAPORAN TAHUNAN, 1986, KETENGAH Annual Report, Central Terengganu Development Authority, Kuala Lumpur, 1987.

_____ LOGGING AND RESOURCES: BURMA SELECTIVE LOGGING PAYING OFF, Asia Pacific Forest Industries, Safan Publishing Sdn Bhd., Kuala Lumpur, July 1989.

_____ LOGGING AND RESOURCES: PHILIPPINES - TACKLING THE PHILIPPINE LUMBER BAN, Asia Pacific Forest Industries, Safan Publishing Sdn Bhd., Kuala Lumpur, July 1989.

_____ LOGGING AND RESOURCES: SARAWAK - ENCOURAGING DOWNSTREAM PROCESSING, Asia Pacific Forest Industries, Safan Publishing Sdn Bhd., Kuala Lumpur, July 1989.

_____ MALAYSIA INFORMATION 1987 YEARBOOK, Berita Publishing Sdn Bhd., Kuala Lumpur, 1987.

_____ MINOR PRODUCTS: COCONUT WOOD, The ASEAN Timberlink, The ASEAN Timber Technology Centre (ATTC), Kuala Lumpur, 1989.

_____ MINOR PRODUCTS: COCONUT WOOD SAWING AND SEASONING, The ASEAN Timberlink, The ASEAN Technology Centre (ATTC), Kuala Lumpur, 1989.

_____ NEWS AND VIEWS APPF: 27th MEETING HIGHLIGHTS, Asia Pacific Forest Industries, Safan Publishing Sdn Bhd., Kuala Lumpur, 1989.

_____ NEWS AND VIEWS INDONESIA: NEW TAX TO CURB TIMBER EXPORTS, Asia Pacific Forest Industries, Safan Publishing Sdn. Bhd., Kuala Lumpur, November 1989.

_____ PRE-REQUISITES FOR ESTABLISHING EXPORT-ORIENTED SECONDARY WOOD PROCESSING INDUSTRIES IN AFRICA, UNIDO, ID/WG.395/4, Vienna, 1978

_____ TRADE FAIRS WOODWORK A BOOST TO MALAYSIAN WOOD WORKING INDUSTRY 89 REVIEW, Asia Pacific Forest Industries, Safan Publishing Sdn Bhd., Kuala Lumpur, August 1989.

_____ UTILIZATION OF HARD WOODS GROWN IN WESTERN SAMOA AND THE SOUTH PACIFIC, THE, Seminar Report, 26-27 July 1983, Apia.

_____ "WORLD FOREST PRODUCTS, DEMAND AND SUPPLY, 1990 and 2000", FAO/UN, Rome, 1982.