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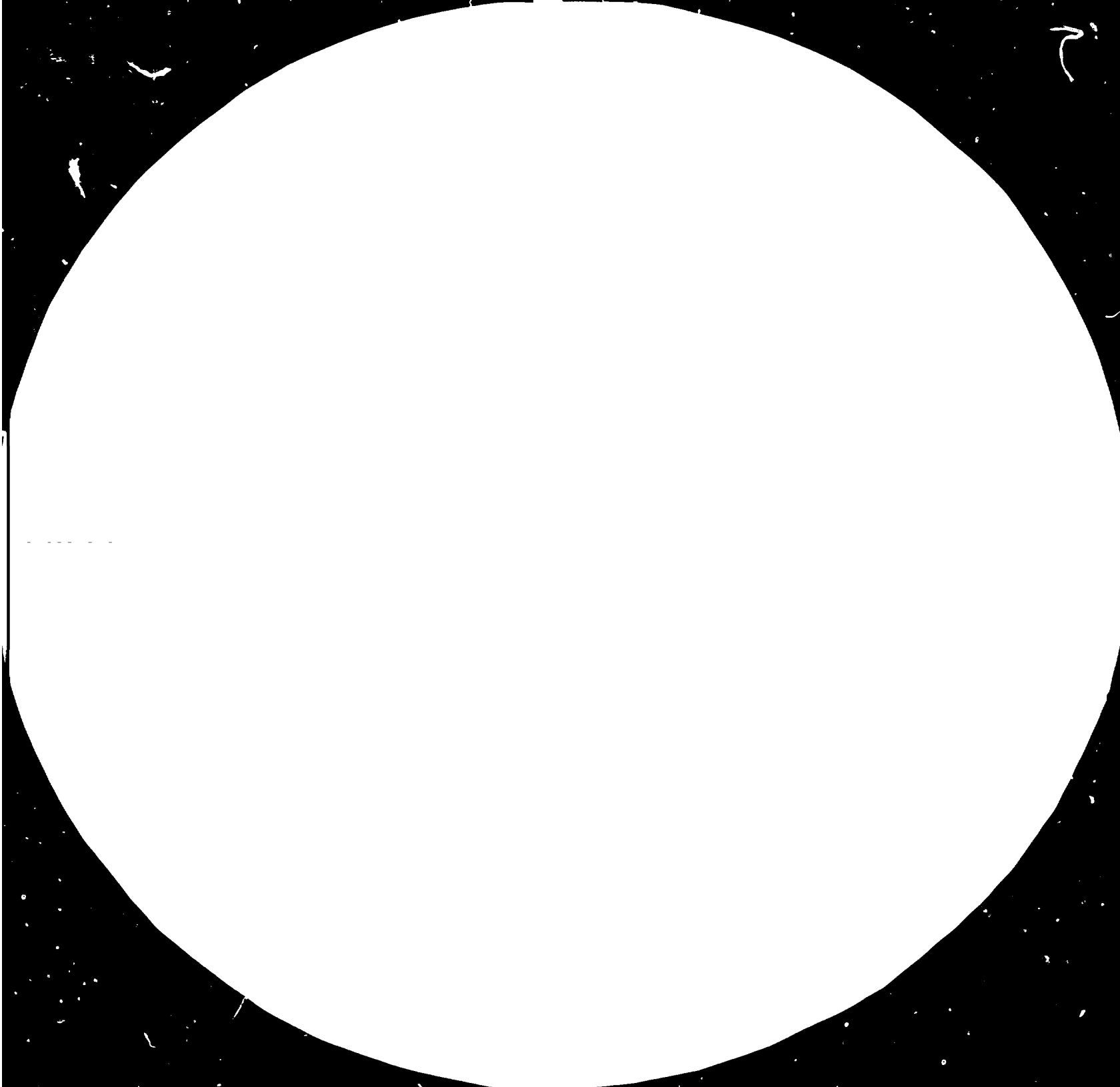
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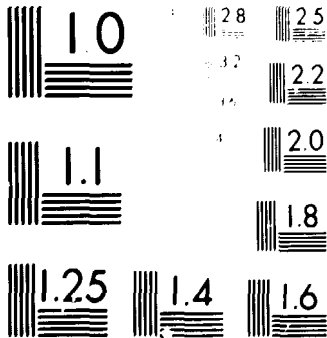
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CURRENT STATUS AND FUTURE DEVELOPMENT
OF THE SECONDARY WOOD-PROCESSING INDUSTRY
OF DEVELOPING COUNTRIES *

by

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1.0 INTRODUCTION

1.1 Background

In implementing the Lima Declaration of 1975, as endorsed by the UN General Assembly at its 7th Special Session in September 1975, UNIDO has been convening Global Consultations on selected industries since 1977.

The First Consultation on the Wood and Wood Products Industry will be convened in Helsinki, Finland, from 19 to 23 September 1983.

1.2 Objectives of this Paper

Regional Preparatory Meetings on the industry were convened for Asia, Africa and Latin America in 1982. The current and future situations of the secondary processing sector (furniture and joinery industry, in particular), together with the other sectors of the wood and wood products industry of various countries within the three regions, were presented and discussed during the regional preparatory meetings. The discussions brought out problems affecting the development of the furniture and joinery industry in the developing countries. Corresponding solutions to these problems, which could form the basis for international and/or regional cooperation, were also proposed. These issues were further discussed from a global point of view at the Global Preparatory Meeting held in Vienna from 24 to 26 January 1983.

This paper seeks to crystallize the issues pertinent to the development of the secondary sector of the wood products

industry (furniture, joinery and wood as a construction material) at a global level, to be used as background for discussions during the First Consultation on the Wood and Wood Products Industry.

2.0 THE FURNITURE AND JOINERY INDUSTRY IN DEVELOPING COUNTRIES

2.1 The Global Situation of the Industry

During the period 1960 to 1970, more than 71% of world manufacturing activities, as roughly indicated by Manufacturing Value Added (MVA), was concentrated in developed market economies, while the share of developing countries was below 9.0%. However, after almost a stagnant period from 1960 to 1968, the developing countries started to improve their share in manufacturing activities such that this increased to about 10.3% of the world MVA by 1981. This steady growth of manufacturing activities in developing countries was matched by a parallel growth of manufacturing activities in centrally planned economies, such that the share of developed market economies in the total world MVA dropped from 78% in 1960 to about 64.7% in 1981.^{1/}

The growth of manufacturing activities in developing countries was principally due to a significant increase of manufacturing activities in South and East Asia countries, together with a parallel increase in Latin American countries, as shown in Table I, below :

^{1/} UNIDO, Handbook of Industrial Statistics, 1982.

TABLE I
SHARE OF DEVELOPING COUNTRIES,
BY THE REGION,
IN WORLD MVA AT CONSTANT PRICES,
(PERCENTAGE OF WORLD TOTAL)
1960 - 1981

<u>R E G I O N S</u>				
Year	Africa	West Asia	South and East Asia	Latin America
1960	0.72	0.43	1.96	4.93
1970	0.80	0.57	2.20	5.12
1981	0.92	0.70	2.74	5.98
Ave. Annual Increase	0.011%	0.0135%	0.039%	0.0525%

SOURCE : Handbook of Industrial Statistics, UNIDO,
ID/284, New York, 1982.

However, this growth in manufacturing activities of developing countries is not correspondingly reflected in the growth of the secondary wood processing branch (with respect to other industry branches in the country) based on the composition of MVA and the relative degree of industrialization of the Furniture and Fixtures, (excluding metal) industry branch, ISIC-332 (see Table II).

Note : For the lack of data on other secondary wood processing industry branches (such as joinery, builders' woodworks, etc.) which would have contributed to a more representative growth pattern for the secondary wood processing sector, the growth pattern of the Furniture and Fixtures industry branch was assumed to reflect the growth pattern of the secondary wood processing sector in developing countries.

TABLE II
INDUSTRIAL INDICATORS, FURNITURE AND FIXTURES,
EXCEPT METAL, (ISIC - 332)

Countries and Classification	NET MANUFACTURING OUTPUT				RELATIVE DEGREE OF INDUSTRIALIZATION	
	Composition of MVA (%)		Ratio of Value Added to Gross Output		In The 1970's by Industrial Branch	
	1970	1978	1970	1978	All Countries	Developed Countries
I. DEVELOPING COUNTRIES						
A. With Ample Wood Resource Base and Large Domestic Market :						
Bangladesh	1.1	0.8	0.612	0.353	1.89	1.76
Brazil (NIC)	2.7	1.8	0.537	0.488	2.15	3.94
Burma	1.5	0.9	n. a.	n. a.	2.12	1.83
Indonesia	0.2	0.3	0.359	0.461	0.35	0.41
Philippines	0.2	0.3	0.482	0.324	0.45	0.62
Zaire	0.6	0.2	n. a.	n. a.	0.57	0.56
B. With Ample Wood Resource Base and Small Domestic Market :						
Bolivia	n. a.	n. a.	n. a.	n. a.	1.31	1.29
Cameroon	1.4	1.2	n. a.	n. a.	1.42	1.37
Ecuador	1.5	1.7	0.560	0.695	1.02	1.09
Honduras	1.9	2.1	0.511	0.388	1.45	1.35
Ivory Coast	1.8	1.7	n. a.	n. a.	1.36	1.40
Tanzania	3.3	0.9	0.585	0.400	1.79	1.63
Zimbabwe	2.2	1.6	0.484	0.447	1.62	1.84
C. With Ample Wood Resource Base, Small Domestic Market, Industry-Oriented :						
Malaysia	1.0	0.9	0.280	0.365	n. a.	n. a.
Zambia	1.6	1.3	0.460	0.503	1.21	1.25
D. With Ample Wood Resource Base, Small Domestic Market, Primary-Oriented :						
Venezuela	1.2	1.2	n. a.	0.430	1.01	1.45
E. Intermediate Wood Processor, Small Domestic Market :						
Hong Kong	2.0	1.0	0.487	0.454	0.84	1.13
Republic of Korea (NIC)	0.5	0.3	0.465	0.578	0.35	0.49
Singapore (NIC)	n. a.	n. a.	n. a.	n. a.	0.32	0.40
F. Net Wood Importer, Large Domestic Market :						
India	1.2	0.7	0.337	0.261	2.30	3.36
Thailand	1.3	0.8	n. a.	n. a.	1.82	2.28
G. Net Wood Importer, Small Domestic Market :						
Kenya	1.4	1.1	0.301	0.288	1.67	1.64
Peru	0.8	0.7	0.516	0.516	0.71	1.00
II. DEVELOPED MARKET ECONOMIES						
A. With Ample Wood Resource Base and Large Domestic Market :						
Canada	1.9	1.7	0.506	0.506	0.88	0.89
United States of America	1.2	1.2	0.527	0.510	0.93	0.72
Yugoslavia	3.8	3.6	0.444	0.394	3.85	2.04
B. With Ample Wood Resource Base and Small Domestic Market, Industry-Oriented :						
Finland	1.5	1.9	0.457	0.521	0.74	0.86
New Zealand	3.9	4.3	0.398	0.371	1.70	1.81
Norway	2.2	2.2	0.505	0.386	0.84	1.05
Sweden	1.4	1.6	0.534	0.508	0.58	0.75
C. Intermediate Wood Processor with Large Domestic Market :						
Federal Republic of Germany	2.8	3.2	n. a.	n. a.	2.11	2.02
Japan	1.5	1.0	0.413	0.438	1.13	0.80
D. Intermediate Wood Processor with Small Domestic Market, Industry-Oriented :						
Denmark	3.1	2.8	0.523	0.539	1.07	1.33
E. Net Wood Importer, with Large Domestic Market :						
France	1.3	1.0	0.404	0.333	0.77	0.70
Italy	2.9	4.5	0.548	0.499	2.37	1.68
F. Net Wood Importer with Small Domestic Market :						
Australia	1.5	1.5	0.444	0.444	0.64	0.69
Netherlands	1.7	1.3	n. a.	n. a.	0.84	0.87

Note : n. a. - Data not available.

NIC - Newly Industrializing Country.

The following observations from Table II indicate that the secondary wood processing sector in developing countries could not have contributed significantly to the growth of the manufacturing sector between the years 1970 and 1978; so that the increase in MVA must have been mainly due to the growth of industry branches other than the secondary wood processing :

- i - Only 4 of the 15 developing countries with ample wood resource base showed slight increases (0.1% to 0.2%) in the MVA contribution to each country's total MVA during 1970 and 1978; while decreases in MVA contribution in the other 11 developing countries ranged from 0.1% (Ivory Coast) to as much as 2.4% (Tanzania) of the country's total MVA for the same years ;
- ii - Correspondingly, all the Net Wood Importer developing countries showed decreases in MVA contribution ranging from 0.1% (Peru) to 1.0% (Hong Kong) ;
- iii - On the other hand, only 6 of the 14 developed market economies showed decreases in MVA contribution from the industry branch ranging from 0.2% (Canada and Yugoslavia) to 0.5% (Japan) of the country's total MVA; 4 countries (the United States of America, Norway, U.S.S.R. and Australia) had no change of MVA contribution from the industry branch between the years 1970 and 1978; and the other 5 developed countries indicated increases of MVA contribution from the Furniture and Fixtures (except metal) industry branch ranging from 0.2% (Sweden) to 1.6% (Italy) of the country's total MVA between the years 1970 and 1978 ;

- iv - Indicators for Ratio of Value Added to Gross Output in Furniture and Fixtures (except metal) manufactures showed a general decrease from 1970 to 1978 among the developing countries selected for this study. Slight increases in the ratio were indicated for Indonesia, Ecuador, Malaysia, Zambia and the Republic of Korea ; and

- v - Indicators for Relative Degree of Industrialization in the 1970's for the Furnitures and Fixtures (except metal) industry branch showed that majority of the 22 developing countries studied lagged in the degree of industrialization of the industry branch, with respect to developed countries.

Considering also the fact that the developed countries' contribution to the world's total MVA was 6 to 9 times the share of developing countries during the period 1970-1978, it may be concluded that the growth of the secondary wood processing sector accounted for a very small portion of the world's total MVA growth and that it lagged significantly behind the growth of the other manufacturing sectors in developing countries.

The 1977 picture of world trade in manufactured wood products, Table III, indicate about the same trends as the manufacturing industry, with developing countries exporting only 14% of the world total exports of wood manufactures. In particular, furniture (SITC-821) exports from developing countries was only 4.2% of the world total for furniture exports, of which 2.5% was exported from seven Newly Industrializing Countries (NIC's) and 1.5% by 44 developing countries other than NIC's.

Export performance for manufactured wood products during the period 1969-1978, Table IV, indicated a slight general up-trend,

T A B L E III

EXPORTS OF MANUFACTURED WOOD PRODUCTS, 1977

(Millions of USDollars)

Country Group	Industry Branch and % Share of World Exports								Country Group	
	Resource Based Exports						Non-Resource Based Exports		Totals and % Share	
	SITC - 243		SITC - 631		SITC - 632		SITC - 821		Total	
Value	%	Value	%	Value	%	Value	%	Value	%	
Developed Market Economies and Yugoslavia	5,604	84.9	2,049	70.2	1,612	86.5	5,188	95.8	14,453	86.0
Newly Industrializing Countries (NIC's)	267	4.0	565	19.3	102	5.5	133	2.5	1,067	6.4
Developing Countries Other Than NIC's	731	11.1	306	10.5	150	8.0	91	1.7	1,278	7.6
World Total Exports of Wood Manufactures	6,602	100.0	2,920	100.0	1,864	100.0	5,412	100.0	16,798	100.0

World Total Manufactured Exports - US\$689,865 million

Note : NIC - Newly Industrializing Countries : Argentina, Brazil, Hong Kong, Mexico, Republic of Korea
Singapore and Turkey.

SITC - 243 - Wood, shaped or simply worked.

SITC - 632 - Wood Manufactures, n.e.s.

SITC - 631 - Veneers, Plywood Boards, Reconstituted Wood

SITC - 821 - Furniture

S O U R C E : Changing Patterns of Trade in World Industry : An Empirical Study on Revealed Comparative Advantage, UNIDO, ID/281, New York, 1982.

TABLE IV
EXPORT PERFORMANCE INDICATORS, MANUFACTURED WOOD PRODUCTS:
1969 - 1978

Countries and Classification	Wood Shaped or Simply Worked SITC - 243				Veneers, Plywood Boards, re- constituted Wood, SITC-631				Wood Manufactures, n.e.s. SITC - 632				Furniture SITC - 821			
	Share in Total Exports of Manufactures		Export Performance Ratio		Share in Total Exports of Manufactures		Export Performance Ratio		Share in Total Exports of Manufactures		Export Performance Ratio		Share in Total Exports of Manufactures		Export Performance Ratio	
	1969-1971	1976-1978	1969-1971	1976-1978	1969-1971	1976-1978	1969-1971	1976-1978	1969-1971	1976-1978	1969-1971	1976-1978	1969-1971	1976-1978	1969-1971	1976-1978
I. DEVELOPING COUNTRIES																
A. With Ample Wood Resource Base and Large Domestic Market :																
Brazil (NIC)	8.869	1.309	7.27	1.40	2.561	0.689	4.73	1.65	0.206	0.498	0.83	1.94	0.155	0.260	0.24	0.34
Indonesia	1.044	6.481	1.03	6.46	n.a.	n.a.	n.a.	n.a.	0.190	0.118	0.88	0.45	n.a.	n.a.	n.a.	n.a.
Philippines	2.395	4.551	2.41	4.67	7.243	4.768	16.24	11.00	0.980	1.789	4.72	6.72	0.296	1.16	0.54	1.41
B. With Ample Wood Resource Base and Small Domestic Market :																
Ivory Coast	16.890	9.639	15.39	9.84	5.101	2.934	10.45	6.87	0.160	0.390	0.72	1.41	0.069	0.061	0.12	0.07
C. With Ample Wood Resource Base, Small Domestic Market, Industry-Oriented :																
Malaysia	9.320	11.955	9.20	12.82	3.624	4.093	8.05	9.82	0.751	0.534	3.60	2.00	0.258	0.16	0.38	
D. Intermediate Wood Processor, Small Domestic Market :																
Hong Kong (NIC)	n.a.	n.a.	n.a.	n.a.	0.003	0.001	0.01	0.90	0.101	0.378	0.77	0.30	0.684	0.728	1.25	0.94
Republic of Korea (NIC)	0.158	0.612	0.06	0.65	14.882	4.268	32.75	10.19	0.186	0.362	0.89	1.40	0.213	0.342	0.39	0.44
Singapore (NIC)	3.306	2.142	3.24	2.29	1.844	1.825	4.06	4.37	0.063	0.134	0.30	0.52	0.193	0.326	0.35	0.42
E. Net Wood Importer, Large Domestic Market :																
India	0.004	0.057	0.00	0.06	0.104	0.252	0.23	0.58	0.018	0.121	0.08	0.45	0.060	0.152	0.11	0.19
Thailand	2.443	1.642	2.46	1.75	0.155	0.786	0.35	1.87	0.727	1.386	3.50	5.35	0.011	0.328	0.02	0.41
F. Net Wood Importer, Small Domestic Market :																
Kenya	0.344	0.308	0.34	0.33	0.161	0.114	0.35	0.27	0.983	0.674	4.64	1.84	0.134	0.286	0.24	0.37
Peru	0.037	0.147	0.03	0.15	0.151	0.294	0.30	0.68	0.000	0.004	0.00	0.01	0.002	0.007	0.00	0.01
II. DEVELOPED MARKET ECONOMIES																
A. With Ample Wood Resource Base and Large Domestic Market :																
Canada	6.068	7.550	5.98	8.09	0.652	0.587	1.53	1.42	0.481	0.742	2.30	2.87	0.247	0.284	0.45	0.36
United States of America	0.566	0.619	0.55	0.65	0.261	0.294	0.57	0.93	0.156	0.182	0.74	0.69	0.169	0.300	0.30	0.38
Yugoslavia	3.603	4.670	3.54	5.00	0.986	0.934	2.18	2.24	0.810	0.795	3.87	3.13	3.081	3.502	5.64	4.52
B. With Ample Wood Resource Base, Small Domestic Market, Industry-Oriented :																
Finland	10.262	4.967	10.10	8.52	5.261	2.978	11.57	7.15	0.525	0.771	2.51	2.99	0.848	1.019	1.55	1.31
New Zealand	1.384	1.002	1.37	1.07	0.267	0.577	0.60	1.39	0.212	0.191	1.02	0.74	0.114	0.464	0.21	0.59
Norway	0.381	0.662	0.31	0.71	0.289	0.177	0.64	0.42	0.295	0.498	1.40	1.94	0.789	0.784	1.44	1.01
Sweden	5.737	4.744	5.65	5.09	0.269	0.444	0.60	1.07	0.545	0.664	2.61	2.59	0.795	1.458	1.45	1.88
C. Intermediate Wood Processor, with Large Domestic Market Base :																
Federal Republic of Germany	0.084	0.138	0.08	0.15	0.238	0.202	0.52	0.48	0.117	0.212	0.56	0.82	0.892	1.181	1.63	1.52
Japan	0.093	0.038	0.09	0.04	0.464	0.116	1.02	0.29	0.282	0.052	1.35	0.20	0.166	0.099	0.30	0.13
D. Intermediate Wood Processor, with Small Domestic Market Base :																
Denmark	0.367	0.264	0.86	0.28	0.527	0.263	1.16	0.63	0.573	1.083	2.73	4.19	2.341	2.684	4.27	3.40
E. Net Wood Importer, with Large Domestic Market Base :																
France	0.270	0.284	0.27	0.30	0.313	0.297	0.69	0.11	0.140	0.202	0.67	0.78	0.425	0.580	0.78	0.74
Italy	0.028	0.032	0.03	0.03	0.476	0.263	1.05	0.63	0.233	0.318	1.11	1.23	0.980	1.257	1.79	2.89
F. Net Wood Importer, with Small Domestic Market Base :																
Australia	0.203	0.189	0.20	0.20	0.141	1.517	0.31	3.63	0.059	0.027	0.28	0.10	0.085	0.053	0.15	0.07
Netherlands	0.036	0.114	0.04	0.12	0.115	0.141	0.25	0.34	0.200	0.215	0.95	0.83	0.580	0.649	1.05	0.83

Note : n.a. - Data for the indicators in this table from the following countries included in Table II are either negligible or not available :

U.S.S.R., Russia, Bangladesh, Burma, Nigeria, Zaïre, Bolivia, Cameroon, Ecuador, Fiji, Honduras, Malawi, Tanzania, Zimbabwe, Zambia and Venezuela.

SOURCE : Changing Patterns of Trade in World Industry : An Empirical Study on Revealed Comparative Advantage, UNIDO, ID/281, New York, 1982.

ranging from +0.005 (Peru) to +0.317 (Thailand), for Furniture (SITC-821) exports from developing countries, but was still much lower than the increases in furniture exports from developed countries which ranged from +0.037 (Canada) to +0.663 (Sweden), in spite of the slight decreases of furniture exports from Norway (-0.032), Japan (-0.067) and Australia (-0.032), during the same period. There was a general down-trend of exports of the other three groups of wood manufactures from the primary wood processing sector in a majority of both developing and developed countries, particularly in the export of veneer, plywood boards and reconstituted wood (SITC-631).

Among the developing countries, the Philippines showed the biggest up-trend (+0.87) in Export Performance Ratio for the furniture industry indicating a significant increase of concentration on the manufacture of furniture during the latter 1970's. Thailand posted an up-trend of +0.37 Export Performance Ratio for the furniture industry during the same period. Except for the Ivory Coast and Hong Kong, which showed negative trends in Export Performance Ratio, all the other developing countries posted positive trends in Export Performance Ratio in the 1970's.

This encouraging trend in furniture exports does not mean much in terms of actual total export values, for the developing countries' share of the total world exports of furniture was only 4% (see Table III). The reasons for this very small share and slow growth in furniture exports are presented in the following paragraphs.

A clearer perspective and adequate understanding of the reasons for the slow growth and constraints to the development of the secondary processing sector of the wood and wood products industry in developing countries today may be attained through summarizing its characteristics as brought

out during the Global and the three Regional Preparatory Meetings. The industry profile given below is typical of the present situation of the industry. However, it is recognized that there are some exceptions to the typical picture presented. These exceptions compose a very small minority in the industry and refer primarily to secondary processing plants which operate a higher levels of technology often by virtue of their being subsidiaries of trans-national firms engaged in the business or because the local firm operates under certain marketing joint-venture arrangements with furniture or joinery distributors in developed countries. Nevertheless, it is held that the following characteristics portray a realistic picture of the vast majority of secondary wood processing firms in developing countries today.

2.11 On Technology and Production

- i - The industry is highly fragmented, composed of units in widely ranging sizes --- from a family-owned and operated shop employing less than 10 workers to big factories employing 300 or more workers. It is a common situation to find the combined outputs of small shops in one country equal only a small fraction of the output of the bigger and more modern factories ;

- ii - The existing levels of technology in one country range from the hand tools stage to fully-mechanized and conveyORIZED factories which are equipped with specialized machinery supported by other industrial auxiliaries needed to sustain volume production of better quality secondary wood products ;

iii - Product specialization and serial production of selected secondary wood products are normally found only in export-oriented firms. These firms usually have foreign marketing arrangements or are subsidiaries of trans-national corporations. The use of basic woodworking machines is generally confined to shops which serve the needs of the higher income segments of the population, hence they usually produce in small series, and are often managed as "mechanized craftsmen" rather than "industrial" plants. Regrettably, however, these pieces of equipment are commonly used as tools, rather than as industrial machines, i.e., the machine serves the man instead of vice versa. This situation is a result of the type of marketing operations conducted by these shops --- they accept orders for any type and design of furniture and/or joinery products in small quantities ;

iv - Quality levels of the products usually correspond to the minimum quality levels acceptable on the domestic market, i.e., they sell on a price basis, which, of course, would hardly be acceptable on the international market for secondary wood products ;

v - The use of insufficiently seasoned sawn-timber leads to faulty joints, poor surfacing of components and a generally low-grade of workmanship. This condition, compounded by the poor state of repair of the machines (lack of proper maintenance), inadequate maintenance of cutting tools (knives, bits, etc.) inaccurate machine set-up, rare use of jigs, and in case

they are used they tend to be badly designed and inaccurate, and the absence of dust and chips exhaustion system, further lead to the inability of the small shops, even though equipped with the basic woodworking machinery, to attain the machining precision required to produce interchangeable components of manufactured wooden products ;

vi - Poor "house-keeping" practices, inappropriate machinery lay-out, lack of internal transport, and antiquated production techniques result to low productivity levels and poor workmanship ;

vii - Except in very few cases, the services of a professional furniture "designer" is not used, for this profession is virtually absent in developing countries. If ever "designers" are available, these are people trained in arts and crafts schools along artisanal methods. Thus, the predominant characteristics of furniture design and joinery construction in developing countries do not make use, but rather prevent, the application of more modern furniture manufacturing techniques which are made possible by extensive use of machines (such as dowels, edge banding of panels, folded panels, rounded tenons, etc.). Oftentimes, the designs are poor copies or adaptations of furniture designs from the developed countries of Europe and America, so that although aesthetically pleasing, they are ergonomically incorrect and usually very costly to produce. It is only in the manufacture of rattan furniture that the design can be considered to have been

originated in the developing countries, for the design of this type of furniture is fitted to the available production techniques. Thus, interchangeability of rattan furniture components, a pre-requisite for lower production and transport costs of the product through the manufacture and shipment of "knocked-down" rattan furniture products is not fully availed of, because current production techniques in developing countries do not make use of machines and jigs which bend and shape a number of poles at one time, and drying facilities to preserve the shape of the bent poles before cutting to final sizes and further machining of the component parts ; and

viii - There is a lack of technical consultants (or extension offices) to serve the industry, and even where they exist, the "closed" mentality of the smaller firms results in their not being consulted.

2.12 On Marketing and Distribution

i - Even medium-range marketing (and consequently manufacturing) programmes are, as a rule, non-existent. Thus, the widely-accepted practices of quality, production and inventory controls are normally non-existent or are practiced at very primitive levels, resulting to undue wastages of raw materials in production operations and high cost of the products. The primary reason for this situation may be traced to lack of adequately trained personnel and the firm's inability to provide the necessary financial

support for the up-keep of such production systems. The situation is further aggravated by such other factors as : a) the lack of specialization in the range of products manufactured and b) the lack of a marketing channel involving a desirable number of retail outlets ;

ii - In the vast majority of cases, deliveries of finished products are based on completely assembled products or sub-assemblies which are assembled at customers' site. Thus, rational product packaging is almost totally absent. The packaging problem is further complicated by furniture designs and manufacturing techniques that do not allow volume shipment of products over long distances. This condition also contributes to the limitation of market coverage for the furniture products.

iii - The few entrepreneurs that have attained higher levels of production output find it hard to sell their products in new and more remote areas of the domestic market as the existing domestic transport infrastructure is not adequate for the transport of secondary wood products over long distances on land and water.

This problem is common to the landlocked countries of central Africa and South America, archipelagic nations like Indonesia and the Philippines; and the less developed countries like Papua-New Guinea, where inadequate land and water transport facilities and infrastructure hinder more accelerated development of the country's economy in general, and the wood processing industry,

in particular; and

- iv - The few existing export-oriented firms are saddled with high freight costs as a result of : a) lack or inadequacy of sea transport infrastructure; b) the small volume of their production is not enough to enable them to avail themselves of the benefits of special rates and c) the loading and discharge ports are too scattered and numerous.

2.13 On Organization and Personnel Training

- i - The small and medium size factory owners usually could not avail themselves of existing incentives for industrial modernization and expansion under their respective countries' development programmes for, on the average, they do not possess the financial, technical and managerial resources and capabilities to do so ;
- ii - The typical organizational set-up shows that supervision and direction of marketing, manufacturing and administrative functions are usually concentrated in one person (the owner) or a handful of close relatives. There is hardly any indication of the existence of middle-management in their set-up. Thus, inefficiency, often because of inadequate supervision become great problems when the firm attempts to expand its operations ;
- iii - These firms are not in a position to make use of the latest results of research and development activities for the industry, because their

management is not properly oriented to such innovations and progress in manufacturing techniques ; and

- iv - The great majority of furniture and joinery shops are usually clustered around urban centers of population. This situation is brought about by the lack of adequate transport facilities (for products, materials and labour) and, in most cases, because they do not have retail outlets in places further away --- for they are not organized to sell on a national scale.

2.14 On the Use of Commercially Less Accepted Species

- i - Except in very few and special cases where non-traditional species are specified by the customer, the industry sector uses traditionally available timber species, for the entrepreneur could not afford to risk his business on species of timber which are not readily acceptable to his customers ;

- ii - Even if the entrepreneur is willing to use commercially less accepted species of timber, these are not usually available. Or if available, he finds it difficult to use the commercially less accepted specie for he is not sufficiently knowledgeable to translate the available technical information on the species in terms of specific use in the furniture and joinery product he produces : the selection of appropriate drying schedules, the adjustments to the machine and cutting tools specifications, and the finishing characteristics which are required to obtain good machining and working of the commercially less accepted species.

2.15 On Country Laws Affecting the Industry

i - A majority of the small and some medium-size secondary wood processing plants in developing countries do not have contacts with the outside. Together with the inborn "secretiveness" of the entrepreneurs who own and operate those shops, this "isolation" prevents them from availing themselves the use of recent developments in machines, tools, surface finishes, upholstery materials, hardware, etc. Or, even if they become aware of such developments, these materials could not be made use of because of such factors as : a) the smallness of their market; b) the complicated import procedures and c) the lack of foreign exchange, thus putting the industry at a disadvantage. In some cases, the efforts of developing countries to protect the local industry's poor quality products through a total ban on the import of these materials, or the imposition of high tariffs on the import of these materials (making them uneconomic to use), compound the problems of further development of the industry ; and

ii - While laws have been passed by a number of developing countries encouraging the importation of machinery, technology and other forms of technical assistance to the primary sector of the wood processing industry, only a few developing countries have provided similar facilities for the industry's secondary processing sector, in spite of the fact that these industries are labour intensive and hence should be encouraged. Some developing countries, allegedly for socio-economic purposes, have laws which tacitly places the development of the secondary wood processing sector in the hands of the local population only, looking at the industry sector purely from the artisanal point of view and

forgetting the industry's potentials for earning foreign currency.

2.2 Wood in Non-Structural Use for Housing and Construction

The development of the joinery industry, in particular, is hampered by the lack of standards which can stimulate larger scale production and also upgrade the small manufacturers with respect to the size of their series and the quality of their products. (It would also reduce costs and thus make wood more competitive with respect to other building materials).

There is still minimal use of commercially less accepted species whose physical and machining properties are already known to be acceptable for use in non-structural items needed in the housing and construction industry. It appears that efforts exerted so far to encourage the use of these species have not yet made any appreciable impact, even in low cost housing programmes where the demand for specific timber species are decidedly less restrictive than those for furniture and other building construction requirements.

As in the furniture manufacturing branch of the industry, the joinery manufacturer is confronted with the same problems of translating the available technical data on commercially less accepted species of timber in terms of machine adjustments, cutting tools specifications, seasoning schedules and industrial coating processes, in addition to the unreliable availability of the commercially less accepted species of timber.

2.3 Trade and Industry Associations

Within the private sector, regional and sub-regional trade and industry associations for the wood and wood products industry in Asia, e.g., the Southeast Asian Lumber Producers Association (SEALPA), for sawn-timber, the ASEAN Panel Products Federation (APPF), for plywood and other wood-based panels, the ASEAN Federation of Furniture Manufacturer's Association (AFFMA) and Asian Furniture Industries Associations (AFIA), for furniture and joinery, have been reported to be actively engaged in safeguarding the interest and promoting

the development of the industry, more particularly in Continental and Insular Southeast Asia, together with Japan, Republic of Korea and the Chinese province of Taiwan. Current activities of these associations are predominantly concerned with the marketing aspects of the industry. More concrete moves related to technical cooperation among the members of the associations still have to be developed at regional or sub-regional levels. Except in few cases, the activities of trade and industry associations at national levels are more socially than professionally oriented.

Except in Asia, there are no reports on the existence of efficient and active national associations, nor of regional federations of national furniture manufacturers associations. More efforts directed to organizing regional groups of furniture and joinery manufacturers are very desirable at this point in time.

At Government levels, the Andean Pact nations (Grupo Andino) Bolivia, Colombia, Ecuador, Peru and Venezuela in South America; the ASEAN (Association of Southeast Asian Nations : Indonesia, Malaysia, the Philippines, Singapore and Thailand) in Asia; the African Timber Organization (ATO) : Cameroun, Central African Republic, Popular Republic of the Congo, Ivory Coast, Gabon, Ghana, Equatorial Guinea, Liberia, Nigeria, Tanzania and Zaire and the "L'Union D'ouaniers et Economique de L'Afrique Centrale" (UDEAC) : Cameroun, Gabon, Central African Republic and the Popular Republic of the Congo have shown keen interest in the development of the wood and wood products industries of their respective areas. Their current activities, however, are more concentrated on forestry, the primary processing sector of the industry and low-cost housing. Recent reports indicate that the ANDEAN PACT through the PADT-REFORT programmes ^{2/} has been active in promoting wood in housing at government levels (standards, designs, etc.). Their programmes, however, do not provide direct assistance to individual firms. Very little is known about their programmes for the development of the secondary processing sector of the wood and

^{2/} Programa Andino de Desarrollo Tecnológico - Recursos Forestales.

wood products industry within their respective areas.

Member countries of these regional groups exchange data on wood species and limited research results relative to the wood and wood products industry through scientific conferences and technical publications. However, there is still a gap in the translation of these data into more useful manufacturing parameters, both in the primary and secondary sectors of the industry. The research and development activities of these nations, much more so in Africa, still have to be oriented to the needs of the secondary wood processing industry, both immediate and long-range.

2.4 Information on and Representation of the
Secondary Sector of the Industry

- i - Reliable and up-to-date information about the furniture and joinery industry in developing countries is not available ;
- ii - Government agencies and international organizations interested in the development of the industry are usually handicapped by the lack of information or the unreliability of available information in their efforts to formulate development and assistance programmes for the secondary processing sector of the industry in developing countries ; and
- iii - Furthermore, Governments of a great number of developing countries desirous of providing assistance to the secondary sector of the wood processing industry find it difficult to discuss the problems of the industry and attempt to

formulate solutions thereto, for the industry (due to its fragmented nature) is not adequately organized and could not get the Government to act on matters recommended by the industry for they do not have proper representation to discuss these matters with the pertinent government agencies.

2.5 Current Research and Development Activities
for the Secondary Wood Processing Industry

Extensive basic research and development activities have been conducted and are still being conducted in many developing countries on the physical, seasoning and mechanical properties of tropical hardwood species. Several developing countries, individually or in cooperation with neighboring countries (e.g., the Grupo Andino, in South America), have investigated the possibilities of using commercially less accepted species of timber in housing and other structural uses. UNIDO has developed timber engineering principles for the construction of modular wooden bridges and other wooden structures in developing countries, and is providing assistance to developing countries in their application.

Yet, research efforts directed toward the development of the secondary wood processing sector appear to have been minimal because :

- i - The meager funds available for research and development activities in developing countries are usually allocated for research and development activities relative to forestry and the primary sector of the wood industry which are usually given higher priorities than the

secondary wood processing sector in the economic development programmes of the countries concerned ;

- ii - Whatever funds remain for the secondary sector are not adequate to support the conduct of desirable extensive programmes for the industry sector, and are thus only enough to fund diverse, small, unrelated research projects whose results are often "filed for future reference" in the records of pertinent entities or agencies ; and
- iii - There is a high turnover of qualified research personnel in the more advanced developing countries as these research and development institutions cannot compete with other industry sectors which offer higher salaries and fringe benefits to trained personnel. This problem is found to be more severe in those developing countries where research facilities provided by developed countries through bilateral government arrangements are handicapped in the conduct of wider research and development activities due to lack of qualified research personnel.

So far, results from such limited research and development activities have provided small benefits to the secondary sector of the wood processing industry in the following aspects :

- i - Development of solar kiln-driers ;
- ii - Development of some local substitutes for imported raw materials ;
- iii - Adaptation of certain wood processing technologies to conditions prevailing in the developing country ; and

- iv - Assistance in the up-grading of managerial personnel from "craft" mentality to "industrial-operations".

It appears that more efforts towards industry-oriented research and development activities are badly needed if the secondary wood processing sector is expected to develop at a rate which will be of significant help to the solution of housing, furniture and other woodworks supply problems of developing countries.

2.6 Current Training Facilities for the Key Humanpower Requirements of the Secondary Wood Processing Sector

2.61 Skilled and Highly Skilled Labour

Skilled and highly skilled labour for the secondary wood processing industry in developing countries are mainly graduates from trade and vocational schools in the country. The majority of these graduates were trained along artisanal lines in carpentry, some are mechanics or electricians trained on the basics of the trade. Because of their training as craftsmen, they are still inadequately prepared to tackle jobs in industry and require further in-plant training to up-grade their skills to a level which will make them desirably useful in secondary wood processing plants operating on an industrial basis.

There is hardly any institution in developing countries of the world which train machine operators, wood-working millwrights, tool grinding specialists, etc., who do not need further in-plant training for an appreciable period of time, for the existing training institutions are not industry-oriented.

Furthermore, there is a lack of "refresher courses" for upgrading the skills of existing craftsmen or mechanics. A solution to this problem is prevented by the lack of contact between training institutions (except in the case of some training institutions in Manila, Philippines and Semarang, Indonesia) and the industry, so that training programmes are not industry-oriented and trainees do not easily find jobs in the industry.

A great majority of these training institutions are operating much below full capacity or have totally ceased training activities for lack of funds and qualified trainers.

2.62 Designers and Product Engineers for the
Secondary Wood Processing Industry

These fields of specialization, which are vital to the development and growth of the secondary wood processing industry are usually not available in developing countries. Except in two or three developing countries in Southeast Asia (India, the Philippines and Thailand) and in two Latin American countries (Mexico and Colombia) there are no reports as to the existence or activities of institutions which offer training courses in these highly specialized fields.

Current furniture "designers" usually obtained their training from experience as draftsmen or detailers of furniture manufacturing firms. Thus, they can not be expected to contribute appreciably to the development of the secondary wood processing industry for they do not usually have the capability to add to the profession's knowledge beyond that which they have gained through experience.

2.63 Middle and Upper Management Training Facilities
for the Secondary Wood Processing Industry

Current training facilities for the middle and upper management levels in the industry are sadly inadequate, if not totally non-existent, in a vast majority of the developing countries. Thus, it is a common occurrence in developing countries, particularly "timber surplus" countries, for their industry development programmes to suffer serious set-backs as a result of lack of adequately trained middle and higher management personnel.

The more advanced developing countries, having realized the importance of a solution to this problem, and have availed themselves of the management personnel training assistance programmes offered by international or regional organizations such as the Asian Productivity Center based in Manila, and Technonet-Asia based in Singapore. The Andean Pact nations have provided for the installation of training facilities to meet the needs of their growing wood and wood processing industries. However, in African developing countries such plans still have to be implemented.

3.0 SPECIFIC PROPOSALS FOR TECHNOLOGIES AND OPTIONS CURRENTLY AVAILABLE
TO THE INDUSTRY FOR ITS DEVELOPMENT IN DEVELOPING COUNTRIES

The constraints to the development of the secondary wood processing industry in developing countries which were discussed in the preceding paragraphs appear to be formidable. However, a rationalization of the approach to solve the problems involved in any development programme for the industry will help guide the developing country in formulating and implementing policies designed to accelerate the development of the industry, taking into account

resources available within the country and such external assistance that may possibly be sought for the purpose. The requirements for development of the industry will vary according to the available resources and state of economic and technological development of the developing country, such that it becomes impossible to formulate a single set of guidelines which may be applicable to all developing countries. The following paragraphs will address the rational sequence of activities that are essential to the formulation of sound and feasible programmes for the development of the industry in developing countries.

3.1 The Product and the Market

The types and designs of secondary wood products are numerous and wide-ranging. In general, the products may be classified as to whether they are structural (e.g., trusses, laminated beams, structural components for pre-fabricated housing, etc.) or non-structural (e.g., furniture fixtures, joinery, mouldings and beadings, other builders' woodworks, etc.). Non-structural secondary wood products will be covered in this paper, as structural secondary wood products will be treated in a separate background paper.

The choice of the secondary wood product to be manufactured is greatly dependent upon the need for the product. The need for the product may be the result of one of the following :

- i - The developing country wishes to meet the domestic demand for the product ;

- ii - The developing country wishes to manufacture the product locally in order to provide the domestic market with substitutes for imported products, and avail itself of the foreign currency savings potential for the endeavour ;

or

- iii - The developing country, in its desire to maximize revenue from the use of its resources, wishes to export the product as a foreign currency generation project, and correspondingly provide more jobs for its people.

In this respect, therefore, the intended market, domestic or international, will have a great bearing on the quantity, quality and costs of the product to be manufactured by the developing country. Entry into the foreign market normally requires the following :

- i - Quantities which are usually much larger than those that would be required by the domestic market ;
- ii - Higher product quality and more restrictive specifications than those called for by the domestic market ; and
- iii - Production costs which would keep the price competitiveness of the product in the foreign market.

Meeting agreed delivery dates is also another important factor that is required for a successful entry into the international market.

Adequate knowledge of the product and the intended market are prime requisites for the development of the secondary wood processing industry in a developing country. However, in view of the fragmented nature of the industry in developing countries, the entrepreneurs usually do not have the financial and/or technical capabilities to conduct market studies. This is an area wherein the government, possibly with the help of

industry and trade associations, can provide assistance to the local secondary wood processing industry.

It is a fact that even "timber deficit" developing countries have successfully exported secondary wood products. It is also encouraging to note that some Asian developing countries have also gained a foothold in the foreign market for secondary wood products (see Table IV). Even less-developed Papua-New Guinea has exported mouldings and woodworks products to the neighboring Pacific countries, although it has not yet gained entry into the foreign market for wooden furniture.

Knowledge of the market, and of the product too, may also be obtained through marketing arrangements with an already established firm from another country (usually a developed country), whereby marketing of the wood products manufactured by the developing country is handled by the foreign partner. This type of arrangement provides the developing country with ample savings in market development and promotion expenses and, to a large extent, leads to acceptability of the product in the foreign market sooner than if the developing country would do it alone. This type of arrangement also usually includes some form of technical assistance which provides the developing country with adequate knowledge of the wood product and the techniques of its manufacture to be provided by the marketing partner. Arrangements of this nature have proven to be successful between Japanese firms and their partners in Burma, Indonesia, Thailand, the Philippines and Singapore and also between firms from Taiwan province and their partners in the Philippines.

3.2 Technology and Production

The choice of appropriate technology for the establishment of secondary wood processing firms in developing countries

T A B L E V

EXPORTS OF SECONDARY WOOD PRODUCTS FROM SELECTED ASIAN DEVELOPING COUNTRIES

Countries	<u>TOTAL EXPORTS, 1981, F. O. B., (x US\$1,000)</u>			
	Mouldings and Woodworks Products	% of Total	Wooden Furniture	% of Total
A. <u>INTERMEDIATE WOOD PROCESSOR COUNTRIES</u>				
Taiwan Province	US\$443,493	76.7	US\$331,907	58.2
Singapore	32,077	5.6	46,357	8.1
Hong Kong	1,162	0.2	65,748	11.5
Republic of Korea	----	---	39,955	7.0
Sub-Total -----	<u>US\$476,732</u>	<u>82.5</u>	<u>US\$483,967</u>	<u>84.8</u>
B. <u>TIMBER EXPORTING COUNTRIES</u>				
Peninsular Malaysia	US\$ 62,539	10.8	----	---
Sarawak	26,090	4.5	----	---
Papua-New Guinea	9,571	1.6	----	---
Philippines	3,275	0.6	----	---
Indonesia	----	---	US\$ 86,700	15.2
Sub-Total -----	<u>US\$101,475</u>	<u>17.5</u>	<u>US\$ 86,700</u>	<u>15.2</u>
GRAND TOTAL -----	US\$578,207 vvvvvvvvvv	100.0 vvvvv	US\$570,667 vvvvvvvvvv	100.0 vvvvv

S O U R C E : Asian Timber, September - October, 1982.

is usually a major problem, for oftentimes it is difficult to assess the capabilities of available local manpower and/or the assessment is done without due consideration of the available supporting industries (e.g., adhesives, paints and coatings, etc.) and services (e.g., machine shops, manpower training for higher skilled labour and middle and top management personnel, etc.), as data and information on such matters are not available or up-to-date. And, more often than not, firms in developing countries rely on the recommendations of machinery suppliers for the choice of technology, which, of course, does not provide the machinery and equipment buyer the desired latitude of decision to determine what is appropriate for its needs from among the various technologies available in the market.

Marketing arrangements, as previously discussed in Section 3.1, which provide for the supply of technical assistance to the firm in the developing country, could be highly instrumental in the choice of appropriate technology inasmuch as the foreign partner also participates in the risks involved in the choice of technology.

Many countries have sought and gained benefits from technical assistance provided by UNIDO. In other cases, the assistance of institutions financing the project have been sought and availed by firms in developing countries in their search for a technical consulting firm which could provide the required technical advice. These are some of the options open to developing countries in their quest to avail themselves of sound advice on the choice of appropriate technology for their wood processing projects.

In general, however, the following pointers may help firms in developing countries choose technology appropriate to local conditions :

- i - Quality levels of products for the domestic market in developing countries are usually not as high as those demanded by the international market. Similarly, quantity requirements in the international market are usually much bigger than those needed by the domestic market (except most probably in India and China, whose huge populations provide large domestic markets for their secondary wood products). Thus, a secondary processing plant geared to produce goods for the international market will require higher levels of technology, in terms of high-volume and high-precision production machinery and equipment. The international market can be subdivided into regional (low quality) and overseas (high quality);
- ii - The current trend in many developed market countries is for panel-based furniture construction, which requires a higher degree of manufacturing precision than the more conventional solid-wood type of furniture construction. Thus, panel-based furniture production will require higher precision machinery and equipment than solid-wood furniture production. This correspondingly will require higher skills in maintenance and repair services for the panel-based furniture factory ;
- iii - From the economics point of view a developing country with more heterogeneous timber resources will have a better chance of maximizing utilization of its timber production and increase the value of its wood resources through more use of commercially less accepted species by encouraging the development of its

solid-wood furniture manufacturing industry ;

iv - On the other hand, developing countries which have programmed for a large wood panel manufacturing industry (as the plywood industry of Indonesia), would be in a better position to increase manufacturing value added by encouraging the manufacture of panel-based type of furniture ;

v - The technique of laminating solid-wood to build-up thicker boards for use in mouldings and other builders' woodworks products has been developed and is available. The resulting product has exhibited better stability properties when subjected to extremes of climatic conditions. Developing countries saddled with high cost of imported sawn-wood may avail of this technology to maximize utilization of the raw material ; and

vi - In general, the need for better trained and higher-skilled labour (machine operators and machinery maintenance personnel) increases with higher levels of technology and sophistication of production machinery and equipment.

3.3 Other Available Production Techniques and Manufacturing Schemes

There exist specific production techniques and manufacturing schemes which are capable of being applied by individual developing countries immediately, apart from an over-all development programme. These systems have a common characteristics that they require relatively low capital investment. Among others, the following are worth considering if not already applied.

3.31 Low Cost Automation (LCA)

Basic woodworking machines can be fitted with pneumatic and electric devices, converting the basic machine into a semi- or fully-automated production machinery, and simultaneously facilitating high quality and quantity outputs at low capital investment costs. This technique is currently known as Low Cost Automation (LCA). The performance of the LCA-fitted machine approaches that of the corresponding brand new machine which would have cost several times more than fitting the LCA costs. This technology will be most effective in countries where basic knowledge of pneumatics and electrics are available in use.

3.32 "Knocked-Down" Furniture Production System

This system has been found effective in reducing the transport costs of the finished products. It also has the corresponding effect of enlarging the market coverage for the product, particularly in situations where the domestic transport infrastructure system is not adequately developed to allow economic shipment of assembled finished products for both domestic and international markets.

The technique calls for the re-design of current lines of furniture product to allow its shipment in the form of component parts, or compact sub-assemblies, rather than the bulky completely assembled product (resulting in high transport costs). Precision machining of component parts of the products (to insure complete interchangeability) and the use of appropriate hardware fittings are pre-requisites for the successful introduction of this system.

3.33 Dowel Construction Type of Furniture and Joinery Products

This production scheme is based on the extensive use of wooden dowels (and proper type of adhesives) to replace the costlier mortise and tenon, metal fittings, woodscrews and nails in joining one component to another. This technique requires a high degree of precision in machining component parts of the furniture or joinery product. However, this technique would be of great help in keeping down unit product costs in developing countries which usually import fittings, nails and woodscrews from remote sources. Utilization of the principal raw material is also increased, since pieces to be joined do not overlap. Furthermore, trimming and ripping off-cuts from appropriate species (which otherwise would be consigned to the woodwaste bins) can be used to make wooden dowels.

3.34 Product Standardization

Selected designs or models of fast-selling furniture and joinery products are adopted as standard products and they are "mass produced" and sold from inventory. Complimentary to this manufacturing scheme is the standardization of the sizes of component parts common to a number of products, e.g., the same sizes for components of desk and cabinet drawers; stiles and rails for window frames; stiles and rails for certain types of doors. This system allows maximum utilization of the available manufacturing facilities and is facilitated by the repeated use of the same set of production jigs and fixtures. Flexibility of this scheme allow either "batch" or "continuous" type of production runs. In this manner, production cost is also kept at desirable low levels by increased productivity.

3.35 Product Specialization

This system could very well be used as the basis for a cooperative effort among the furniture manufacturers within a developing country where investment capital is not readily available. The underlying concept of the system calls for the manufacture of a very limited number of wood products by one factory, each of which is geared to be complementary to a product being manufactured by another firm. This system which should be introduced on a national level could eventually be applied on a regional scale, among developing countries themselves or in co-operation with developed countries.

At country levels, this system calls for the manufacture of a specific line of furniture product or their component parts, which are then channeled to other furniture or joinery manufacturing firms for the final operations which would complete the product or set of products. For example, a firm specializing in upholstered products does not have to install its own production facilities for the frames, if these can be supplied by other shops specializing in the manufacture of wooden frames for upholstered furniture items. Firms can also specialize in veneering and edge banding panels, surface finishing of panels, etc.

One of the major handicaps to the successful initiation of this system in developing countries is the lack of willingness to collaborate among the owners of the small individual firms. Another problem is the lack of up-

to-date and accurate information about the industry.

Steps should be taken, possibly through the help of industry or trade associations engaged in the manufacture and/or distribution of furniture or joinery products, to overcome this handicap. It is easier to introduce this type of collaboration between firms in centrally planned than in market economies.

3.4 Moder Industrial Engineering and Costing Methods

Furthermore, the current costing systems used by the small and medium size secondary wood processing firms are inadequate to help their managements decide whether it will be profitable for them to purchase components from other firms or produce these components themselves. The need for action in this direction is indicated by the fact that these firms are not even in a position to tell which of the various product types they are producing are real profit-making products. Thus, recognizing the fact that a great majority of the secondary wood processing shops are engaged in the manufacture of a wide variety of product lines, the need for a more responsive and accurate costing system becomes evident and urgent. Productivity could be increased by using modern industrial engineering methods, and better designed jigs and properly located and oriented work stations.

3.5 Other Sources of Technical Assistance

By no means is it implied in Section 3.2 that technical assistance should be sought only from developed countries. Some developing countries have attained growth levels of the industry which place them in a good position to provide technical assistance to other developing countries, in the same manner that skills and technology in logging and sawmilling developed in the Philippines helped develop the

counterpart industry sectors of Indonesia. In fact, technical assistance in furniture and joinery production from Singapore and the Republic of Korea would be most desirable for developing countries, for these "Intermediate Wood Processor" countries have gained a significant amount of experience in the production and marketing of furniture and joinery products for the international market.

It will not be a surprise if the technology developed by these developing countries finds better applicability and acceptance in other developing countries in their efforts to develop their secondary wood processing industries on either domestic or export oriented basis.

3.6 Machinery and Cutting Tools Specifications for Processing Tropical Wood

Machinery with feed rates and cutting speeds appropriate for processing of tropical wood have been designed and are now widely used in both developed and developing countries. The development and current extensive use of tungsten-carbide-tipped (TCT) saws, bits and knives in both developed and developing countries, have further complemented the array of available machinery and equipment for processing tropical wood. Thus, within the sphere of current industry needs, machinery and cutting tools specifications should not pose a problem to the development of the secondary wood processing industry in developing countries. Problems should be expected, though, in the proper use and maintenance of the machines and cutting tools.

3.7 Transport Systems and Infrastructure

Continuous and adequate supply of raw materials for secondary wood processing plants depend greatly on the available transportation facilities. Similarly, the manufactured products

need to be transported to domestic distribution centers by land (or water, as the case may be), or to loading ports if the products are to be exported. Sawmills, the prime supplier of the major material input to secondary wood processing plants, are usually located in areas far from furniture and joinery plants, which are located near or within the big urban centers of developing countries. This situation, together with the fact that deliveries of finished goods are usually made on the basis of bulky assembled products, heighten the need for adequate transportation systems to enable the furniture and joinery firms to serve the needs of remote and smaller urban areas of the developing country. The problem is made more severe in developing countries where the raw materials and/or finished products have to be transported across the seas, as in the case of Indonesia, the Philippines, Malaysia and the island provinces of Papua-New Guinea, for good ports and sea transport facilities become necessities for further development of the domestic market oriented industry.

The same needs for improved land and sea transport facilities is found in the case of export-oriented secondary wood processing industry. Adequate land transportation systems are needed to collect the finished goods from the widely scattered manufacturing centers and transport the goods to loading ports. Furthermore, the port facilities need also be improved to enable them to handle containers, which to-date provide the best means of handling and transporting secondary wood products.

3.8 Industrial Estates for the Secondary Processing Sector of the Industry

i - Governments of some developing countries, aware of the inability of the small and medium size furniture and joinery firms to bear the high

cost of supporting facilities and infrastructure (kiln-drying, electric power supply systems, service centers and cutting tools for machinery and maintenance, etc.) have launched assistance programmes to the wood processing industry involving the establishment of industrial complexes where support facilities are provided for the common use of plant locators in the industrial complex. Assistance is also given in the procurement of common production materials and supplies and export warehousing facilities. Some programmes, particularly in export-oriented projects, include provisions for bonded warehouses (both for imported raw materials and finished goods for export) and financing schemes designed to help assure the producer of continued production operations between export shipments ;

and

ii - Building costs are heavy initial investment items for most medium and small entrepreneurs. Government assistance in the form of lease-purchase arrangements for the construction of factory buildings would be of great help in encouraging firms to re-locate in industrial estates.

3.9 Integration of the Primary and Secondary Wood Processing Plants

Governments of some developing countries have provided special incentives for industrial projects integrating the primary and secondary sectors of the wood processing industry. The objective is to attain higher utilization of the raw material and residues at each stage of the integrated process.

The concept of integration may find maximum application when

manufacturing value added is considered in the choice of raw material grades in plant inputs. High grade tropical logs give higher yields both in terms of quality and quantity of panel outputs, when converted into plywood. Higher yield rates are also obtained when high grade tropical logs are converted to sawnwood. However, in terms of value added, plywood produced from one cubic meter of high grade log will give higher revenues than sawnwood produced from the same cubic meter of log. Thus, maximum revenue generation for the integrated wood processing complex may be better attained by processing the higher grade logs into plywood and the lower grade logs into sawnwood. A woodworks or furniture plant may be erected in the integrated processing complex to convert a major portion of the sawnwood output and part of the plywood output into furniture or builders' woodworks products. The establishment of kiln-drying facilities is of course necessary to provide properly seasoned sawnwood to the furniture, joinery or woodworks plant. The low grade sawnwood output of the sawmill need not be kiln-dried and may be sold in the local market for use as scaffolding material in the construction industry and in the fabrication of concrete formworks. Further utilization of the industrial residues generated in the three main processing plants may be realized by the establishment of a blockboard plant, a small particleboard plant or a small fibreboard plant. Market characteristics, the minimum economic plant size for each type of plant and the supply of synthetic resins must be considered in the choice of the type of secondary wood and industrial residue processing plants to be established in the integrated complex.

The ideal integration scheme presented above assumes that the tropical timber supply is homogeneous enough to meet the volume requirements of the plywood plant. The scheme, however, needs modification when being applied to developing countries

with more heterogeneous timber stands, as in Brazil, Papua New Guinea and West Irian in Indonesia. Sawmilling as the principal primary processing plant will be more desirable in these areas. A limited capacity for plywood manufacturing may be installed provided the volume of timber of the same group of species can justify doing so. In this case, it may help justify the economic aspects of the small plywood plant if premium species of timber will be sliced and used as face veneer for plywood panels.

The establishment of large particleboard or fibreboard plants as part of the integrated complex in developing countries is not advisable as long as the domestic market cannot use all the output or the resulting cost of the reconstituted wood panel makes it non-competitive in the international market.

4.0 THE INDUSTRY'S MAJOR ISSUES

The typical characteristics of the current secondary sector of the wood processing industry, and the allied/supporting service facilities necessary for the growth of the industry and the options open to the industry and the developing country presented in the previous paragraphs indicate the solution of the following issues (pertinent to the industry sector) as pre-requisites for any significant development of this sector.

- 4.1 The need to have active, technically-minded and industry-oriented professional and trade associations to represent the industry at all levels and in all fora.
- 4.2 The need for technical assistance to the industry in developing countries in order to attain a level of industrial technology appropriate to the conditions within the developing country and adequate to meet the objectives of the country's programmes for the development of the secondary wood processing sector, through :

- i - The introduction of and/or further development of basic concepts of product standardization, design and product engineering.

Product standardization will facilitate higher levels of serial production, thus, reducing production costs. Proper design and product engineering will allow more effective utilization of raw materials, aside from contributing to the attainment of higher production outputs and better quality products.

Development of these three aspects of the industry to suit local conditions has become a necessity in developing countries which have launched programmes for export-oriented secondary wood processing, such as those in Latin America, Southeast Asia and the more advanced developing countries of Africa.

- ii - The proper selection and judicious acquisition of production and auxiliary machinery and equipment, their lay-out and installation using normally accepted engineering practices.

Proper selection of production and auxiliary machinery and equipment will help assure the developing country of the choice of technology which its labour resources could learn to operate fully and efficiently and maintain adequately, and which its managerial and supervisory force could learn to manage effectively within a shorter period of time than what has happened so far. Judicious acquisition of machinery through an in-depth

technical evaluation of tenders for the supply of machinery, including the proponent's ability to furnish after sales service, should help curtail machinery maintenance problems and keep the project's initial capital outlay at levels which will help the developing country minimize its foreign currency outflow.

- iii - The introduction and/or further development of manufacturing techniques which lead to better stabilization of wood in service, higher level of precision in machining operations and better protection of the finished products while being transported to the market.

Proper seasoning of sawnwood leads to better machining precision and helps lengthen the service life of the wooden product. The use of properly designed jigs and fixtures helps assure good machining precision, so that component parts of the wood product fit together, without further need for hand-tooled adjustments. Well chosen and properly applied adhesives and properly dimensioned and well driven nails and woodscrews assure good joints and a longer service life of the wooden product. Appropriately chosen and correctly applied finish coatings not only enhance the aesthetic aspects of the wooden product, but also help protect the wood, thus lengthening its service life. Good packaging techniques will assure the protection of semi-finished or finished wooden products while in storage or in transit from the factory to customers' place.

- iv - The introduction of acceptable systems of quality control, and workable systems of production and inventory control, and their gradual development to suit the available local resources and conditions.

The installation of a quality control system suited to local and/or export quality levels, covering the materials input, processing and finished goods stages of the manufacturing operations will help assure better acceptance of the wood products on the market. The introduction of workable production and inventory control systems will help assure continuous production operations, keep production costs at desirable levels and ensure delivery of the product on the agreed upon date.

- v - Facilitating the import of the necessary inputs and establishing drawback systems that function smoothly to put the industry in a position to compete on the international market.

It is a fact that a great majority, if not all, of the developing countries are not yet self-sufficient as regard some or most of the necessary inputs (sawnwood, wood-based panels, adhesives, abrasives, surface finishing materials, woodscrews, nails, hardware and fittings) for the secondary wood processing industry. A number of developing countries, in their efforts to conserve foreign exchange, have instituted controls on importation and domestic

distribution of these items which, directly or indirectly, adversely affect advanced stages of manufacturing, thus putting the local industry (including the secondary wood processing sector) at a disadvantage on the foreign market. Establishment of effective draw-back systems should help the industry overcome this handicap.

- vi - The development of smaller and lower cost timber drying facilities, preferably using woodwastes as fuel or some type of system that does not involve the use of high-cost boilers, thus placing these within the purchasing capabilities of small and medium size woodworking shops (either individually or jointly with other firms), in order to place these firms in a position to sell their wood products to customers (foreign or within the same country) located in areas with different climatic conditions.

As cited in paragraph 4.2 (iii), proper seasoning (kiln-drying, in most situations) of sawnwood is a necessary ingredient to better quality and longer service life of wooden products. Kiln-driers currently available have rated capacities and costs greatly beyond the sawnwood volume needs and financial capabilities, respectively, of individual secondary wood processors to acquire and operate economically. The need for development of smaller and lower cost timber drying facilities is more particularly acute in situations where the climatic conditions in the place of manufacture of the

wooden product differs significantly from the climatic conditions in the place where the same products will be eventually sold and used.

- vii - The preparation of market surveys, the development, dissemination and installation of standards appropriate to wood products supplied by developing countries, the creation of inspection schemes leading eventually to a quality label and such other activities which will make these products acceptable and competitive in the foreign market.

Among the major barriers to the entry of secondary wood products from developing countries into the international market is the lack of knowledge of the foreign market on the part of developing countries. There are secondary wood processing plants in some developing countries which have production capacities greatly in excess of the domestic needs, but whose production costs are too high to be competitive on the international market. Secondary wood processing firms in developing countries which have attempted to penetrate the international market have been dismayed by their inability to meet the high quality specifications of manufactured wooden products acceptable on the international market. In many instances, suppliers of manufactured wooden products from developing countries have misunderstood quality assurance procedures required by foreign customers, and eventually suffered tremendous losses as a result of rejects and claims against shipments to the extent that in some cases their manufacturing operations

collapsed. The introduction of quality control at the plant level could overcome this problem, but there remains the problem of allaying the fears of the importers with respect to quality. Feasible inspection schemes leading to a quality label appear to be a solution to this problem.

4.3 The need for assistance in the training of the developing country's labour resources to meet the changing demands of the growing secondary wood processing industry, in conjunction with the projected growth of the other sectors of the country's economy, through :

- i - Establishing new, or up-grading the existing training facilities within the country or region.

The current situation shows that a big majority of developing countries, more particularly in Africa and the less developed areas of Latin America and Asia, do not have adequate training facilities for the labour needs of the secondary wood processing industry. Furthermore, the few existing training facilities were designed to train craftsmen rather than industrial workers. Thus, new and appropriately designed training facilities, and the up-grading of existing training facilities are needed if the secondary wood processing sector is to grow at a pace and level which will meet the economic development programme of the country concerned.

More emphasis should be placed on providing short intensive courses for persons from industry. These should go hand-in-hand with

with the traditional vocational training.

- ii - Adopting measures to encourage technical cooperation among developing countries through the exchange of trainees for the secondary wood processing sector.

The undesirable imbalance between the supply and demand for adequately trained labour to meet the needs of the secondary wood processing sector plagues almost all developing countries. More than anywhere else in the world, this imbalance is most severely indicated in Timber Surplus developing countries such as Indonesia and Papua-New Guinea, which have embarked on massive development programmes of their wood and wood products industry. Yet, almost all of the labour training centers within these and neighboring countries are operating well below maximum capacities, where language would be no problem. Encouraging the exchange of trainees for the secondary wood processing industry will be beneficial to all the countries concerned, in terms of avoiding the high costs of establishing new training facilities and maximizing the utilization of the existing facilities.

- iii - Providing specialists from developed countries to train trainers from among those qualified to be trained as such in the developing countries.

This measure will help fill the needs for qualified trainers in most of the existing training facilities in developing countries, and contribute greatly to the training programmes for various labour skills needed by the industry.

- iv - Establishing training facilities for middle and upper management of the industry in developing countries.

This will help assure the secondary wood processing industry, together with other industries in the developing country, with properly trained middle and upper management personnel. This has been pointed out in previous paragraphs as a major deterrent to a desirable pace of development of the industry in developing countries. This solution can be effective if owner-managers of small firms, who often look at training programmes for his workers as developing potential competitors in the future are convinced of the advantages such training programmes can give to his production activities.

- v - The training of machine operators capable of maintaining and setting-up machines; and the design and fabrication of jigs, fixtures and quality control gauges, as against the current practice of training carpenters, joiners and cabinet makers with but limited experience in the operation of a very limited range of basic wood-working machines, operated on an ad-hoc -- and not serial production (industrial) basis.

A re-orientation of current training programmes and existing facilities in developing countries to produce workers for the industry rather than craftsmen is indeed necessary.

- vi - The training of sawdoctors, mechanical, electrical pneumatic, hydraulic and electronic technicians to maintain the new generation of tools and machines.

To help assure proper and desirable development of the secondary wood processing industry in developing countries, it is of extreme importance to train workers in highly skilled jobs that will keep the machines running smoothly and allow the production of precise components, in addition to machine operators. This phase of the industry is often forgotten or given little importance in the formulation of programmes to develop the secondary wood processing industry in developing countries.

- vii - The publication of basic training material at the appropriate level and in the native tongue to teach the operators.

The language barrier, in addition to the limited basic knowledge of technical subjects, has been a deterrent to the proper and effective training of the work force in developing countries. Furthermore, the available technical literature has been written at levels beyond the comprehension of the workers in developing countries. Thus, more efforts similar to those currently being done at the Institute of Woodworking Industry Training (Pendidikan Industri Kayu Atas) in Semarang, Java, Republic of Indonesia, and those done by UNIDO in Indonesia, Laos, Sri Lanka and other developing countries, should be exerted to translate to the native tongue and modify and translate (in the native tongue also) existing manuals and technical literature down to a level which could be readily understood by the labour force in developing countries.

viii - Ignorance by the industry of the recent technical developments in the developed countries. Samples of the materials (wood based panels, upholstery materials, hardware fillings, etc.) used by the industry in the developed countries should be acquired by the training institutions for exhibiting to the local industry. This might induce their being imported.

ix - The publication and wide dissemination of technical newsletters to inform the industry of new developments.

The cooperation of existing research and training institutions, as well as of the industry and trade associations in this endeavour should prove of great assistance to the development of the secondary wood processing industry.

Most developing countries are unaware of the latest technical developments in the industry of developed countries, which calls for the strengthening or creation of research and development institutions.

4.4 The need to maximize the application by the secondary wood processing industry of results of research and development activities in the country and from other developing and developed countries, through :

- i - Establishing regular fora and such other media through which the industry and the research and development institutions can exchange information on their needs, current activities and accomplishments thus helping make research and development activities more attuned and responsive to the needs of the industry.

Fora and media at the global, regional and sub-regional levels should be in the form of technical conferences and seminars, meetings between industry and research and development institutions, and among those involved in the industry and corresponding trade of its products.

- ii - Encouraging more numerous and more frequent interchange of information on research and development activities and their results among the existing institutions in the countries involved in international or regional development of the secondary wood processing industry.

Although those responsible for research and development activities related to the secondary wood processing industry are desirous to see a better exchange of information on the direction, status and results of their endeavours, they find it hard to do so for lack of funds. Ways and means should be found of encouraging such exchanges.

iii - Encouraging the development of substitutes for imported materials through the use of indigenous materials and resources, including such secondary materials and supplies as paints, finishing materials, glues and other adhesives, screws, nails and other hardware items, upholstery materials, etc.

Some developing countries have indigenous materials (e.g., coconut timber and rubber wood) which may be used as substitutes for the traditionally-accepted species in certain types or components of secondary wood products. Other developing countries have on-going projects aimed at producing materials or housing components from non-conventional sources, e.g., the production of adhesives from tannings using nut shells, cashew nuts and other non-conventional plant parts and fruit sources, the manufacture of corrugated fibreboard, roofing sheets out of wood-processing factory residues in China and the manufacture of core panels out of rice husks in India. The Philippines has developed latex impregnated coconut coir, and Malaysia has produced natural rubber latex foam materials for upholstery. Provided, of course, that the resulting product quality and cost is still acceptable to the market, similar endeavours should be encouraged with the aim of attaining a certain degree of self-reliance as regard materials which are traditionally imported into the developing country.

- iv - Maximizing utilization of existing research and development facilities through cooperative efforts at regional levels.

Various developing countries which consider secondary wood processing as an important sector of the national economy have research and development facilities, government and/or privately funded and directed. These research and development institutions have similar, if not identical programmes, or are working on projects which have either been previously completed or are being undertaken in another developing country. Fostering coordination and complementation of research and development activities among developing countries will help avoid unnecessary expenditures of the developing countries' limited funds for research and development. It appears that establishment of regional coordinating centers for research and development will provide a great boost to the growth of the industry in this respect. Participating countries, of course, should be entitled to share in the results of the research and development activities under this programme.

- v - The use of research and development to modify traditional craft operations for machine production (with hand finishing).

The current secondary wood processing industry

in developing countries is highly dependent on highly skilled craftsmen for its key labour personnel. Highly skilled craftsmen require years of training. The use of research and development to industrialize existing craft methods will certainly require less skilled labour, help increase productivity significantly and reduce production costs, while at the same time shorten the training period for the desired skills, and reduce the number of trainees needed.

4.5 The need to encourage and intensify technical and financial assistance to the efforts of some developing countries to reduce foreign currency outlays for the industry, thus helping increase the chances of survival of wood processing plant projects, and assuring more rapid development of the industry, through :

- i - The use of appropriate locally fabricated machinery and equipment (or made in developing countries within the region) designed to meet requirements of local conditions in the developing country.

It is a fact that at present a big gap exists between the secondary wood processing technology in developed countries (which, generally, are the sources for the industry's machinery and equipment) and that found in developing countries. This technology gap has been increasing and will continue to increase in the years to come. In fact, some developing countries are now faced with serious problems in the supply of spare parts for machinery which

are no longer being manufactured. Furthermore, certain developing countries have been wrongly advised in acquiring machinery and equipment which are beyond the capability of their labour forces to operate properly and maintain adequately. In other cases, some developing countries have acquired certain processing technologies which require the use of material inputs (principal or secondary) which have to be imported by the developing country from the country that supplied the machinery, thus making the developing country's processing plant greatly dependent upon the supplier country for its supply of the vital material. Many such factories have ceased to operate once it has become uneconomical for the developing country to import the material.

- ii - The use of locally fabricated production and ancillary materials and supplies such as paint and other coating materials and supplies, adhesives, abrasives, nails, screws and other hardware items, upholstery materials and packing supplies.

The arguments presented and discussed in Section 3.3 also apply to locally fabricated production and ancillary materials.

- 4.6 The need in the larger and more advanced countries, to establish specialized research and development centers to cater for the needs of the industry (such centers exist in most of the developed countries).

There is need for specialized research and development centers in some of the more advance developing countries which have technical problems peculiar to the country alone. To illustrate, the "Blue Stain" problem

encountered in the use of Ramin in Indonesia and Malaysia for secondary wood products has led to untold great losses in terms of production rejects and lowering of product quality. Developing countries which have rubber plantations (e.g. Sri Lanka, Malaysia, Brazil, Thailand and the Philippines) desiring to use rubber wood as a material for secondary wood products need to know more about the proper way of handling the sawn-wood, its seasoning techniques, machining and finishing properties. Success of specialized efforts in this direction would make rubber wood (with desirable shorter felling cycle) a good substitute for the traditionally known timber species on the market. Similar efforts have already been started in the use of coconut timber in the Philippines. It appears that a major handicap to a desirable pace of activity in this field is the lack of funds, in addition to the inability of the industry sector (due to its fragmented nature) to obtain government support for the establishment of a research and development center and lobby for the acceptance of these species by national standards.

5.0 AREAS FOR REGIONAL/INTERNATIONAL COOPERATIVE EFFORTS

In addition to the opportunities for cooperative efforts at regional or international levels mentioned in previous paragraphs of this paper, the following areas of endeavour which are allied to or support the secondary wood processing industry in developing countries provide more opportunities for cooperation among countries.

5.1 Research and Development for the Secondary Wood Processing Industry

Extensive basic research on forests and timber have been and are still being conducted in developing countries. Regrettably, similar efforts in industry-oriented endeavours have been neglected. So much is yet to be known about how to design

furniture using available indigenous materials, portraying the culture and arts of developing countries. Product engineering, which could be used to translate the product design in terms of production parameters that would facilitate manufacture of the product having the desired structural and aesthetic characteristics at the least possible cost, is hardly known in many developing countries. Production of adhesives from available natural materials, as a substitute for imported synthetic resins, offers potentials for foreign currency savings. Knowledge of surface painting and coating requirements and fastening characteristics of many tropical timber species is still inadequate such that wood products from developing countries fail to meet acceptance in the international market because they were poorly joined or finished or painted. More economical kiln-drying cycles still have to be developed for tropical timber species other than the traditionally known species. These are just a few among the many aspects of the manufacturing processes for secondary wood products which have to be known where research and development activities can help assure continued and healthy growth of the industry in developing countries.

The training of competent research and development personnel, the required research and development facilities and the conduct of such research and development activities require money and time. It is regrettable that only a few developing countries could allocate enough money for research and development activities.

The options open to developing countries to solve this problem are : a) Co-ordination of research and development activities among developing countries, complemented by pooling of research and development facilities ; and/or b) Technical aid and/or assistance in seeking funding sources (most possibly from developed countries) under arrangements similar to those extended by the Japanese Industrial Cooperation Agency (JICA),

the Canadian Industrial Development Agency (CIDA) and other international industrial assistance agencies.

5.2 Manpower Training for the Secondary Wood Processing Industry

One of the principal handicaps to the speedy development of the industry in developing countries is the lack of properly-trained labour to operate and manage the projected wood processing plants under the country's industrial development programme. Yet, it is surprising to note that most of the existing training facilities for the industry are not being fully utilized, primarily because of lack of funds and qualified trainers. Furthermore, existing training facilities do not offer courses aimed at up-grading existing skills which is quicker and cheaper than starting from scratch with school learners. The current imbalance between the demand and supply of trained labour is so great, and is still expected to increase under the current development programmes of timber-rich countries.

Machine operators can be trained on the job. However, training of highly skilled labour (e.g., woodworks millwrights, sawfilers and knifegrinders), technical support personnel (e.g., mechanics, electricians, quality control testing laboratory technicians) and the supervisory and management staff need formal programmes and adequate facilities.

Some developing countries in Asia (China, India, the Philippines and Thailand), Latin America (Brazil, Peru, Chile and Argentina) and Africa (Egypt) have attained levels of manpower training activities which could be shared with neighboring developing countries.

5.3 Sea Transport and Infrastructure for Secondary Wood Products

Another major barrier to the development of the secondary wood processing industry in efforts of developing countries

to attain a foothold in the international market is the high cost of sea transport for the industry's products. While the industry has developed and is currently engaged in cooperative measures to avail itself of the services of sea carrier systems which have been developed to transport round logs, wood-based panels and sawnwood economically from the sources to the market, this is not true for secondary wood products. A great portion of the industry's products are still transported as "filler cargoes" in both conference and non-conference vessels, and as such are charged the higher freight rates applied to "general cargo", for the small shippers have not yet formulated, nor perhaps realized the value of, a system which will enable them to ship their small volume of outputs in "group shipments". It appears that further rationalization of their marketing activities will help them avail of the lower freight costs for volume shipments. The volume output of the industry is unlikely to ever be enough to warrant economic transport on specialized carriers, thus cooperative efforts among the countries concerned should be even more important in order to attain a solution to the problem. The principal pre-requisite to a successful implementation of this recommendation is the improvement of existing domestic sea and land transportation infrastructures (ports, roads, etc.) in both quality and number.

5.4 New Markets for Secondary Wood Products from Developing Countries

The past decade has indicated the emergence of selected countries in Middle East as new markets for joinery and builders' woodworks products from developing countries. Yet, available statistics show that the developing countries' share of the market (as of 1979) is less than 25 percent of the total for the seven selected countries (Saudi Arabia, Abu Dhabi, Oman, Kuwait, Iraq, Jordan and Egypt). The aggregate volume of

imports of joinery and builders' woodworks was approximately US\$120 million in 1979 and all indications point to further increases in these imports through the end of this century, as the oil-rich countries continue their housing and construction programmes.

The timber-rich developing countries need oil to run their factories and money to fund their wood processing industry development programmes.

Direct arrangements between the oil-rich Middle East countries and the timber-rich developing countries for the latter to supply the former with the furniture, joinery and builders' woodworks products in exchange for the supply of oil and financial aid for the development programmes of the latter will help accelerate development of the secondary wood processing industry in developing countries. Inasmuch as a majority of the secondary wood processing firms in developing countries are small and medium size plants, and are not yet adequately organized to negotiate for such arrangements, it behooves their governments to take action on behalf of its secondary wood processing industry and at the same time prepare the industry to meet the increased demand for secondary wood products, even up to the extent of arranging for technical assistance from external sources (possibly a developed country, the UNIDO or another developing country which is more knowledgeable and has more experience in the field of assistance being sought).

5.5 Industry Aspects for Technical Assistance Arrangements

Successful implementation of regional complementation arrangements similar to those proposed in Sections 3.3 and 3.5 will be better assured if agreements on quality specifications, and design standards of secondary wood products are reached between the participant countries. Assistance of third

party countries (possibly a developed country knowledgeable in the aspects under discussion) or United Nations agencies (UNIDO or ITC) may be called upon to assist in the establishment of standards and quality control specifications where knowledge on the subject is not sufficient or available among the participant developing countries.

Some developing countries like India, Brazil, Portugal, Singapore, the Philippines and China have started producing woodworking machinery which suits local conditions. Some of these countries have even exported woodworking machinery to other developing countries, particularly those which are oriented to serve the domestic market. As has been pointed out in previous paragraphs of this paper, the sophistication of most woodworking machinery supplied by developed countries is oftentimes beyond the capabilities of most developing countries to operate properly and maintain adequately. Thus, it appears that the demand for woodworking machinery designed to suit local conditions in developing countries will continue to increase until such time when labour skills and technology levels in developing countries have developed to a point which would allow the proper operation of sophisticated machinery.

Since it could be more economical to produce such types of machinery in the developing country due to lower quantities to be produced, technical cooperation in the form of licensing or joint venture arrangements may be sought by developing countries so that they can improve the performance and increase the precision of the machines designed to suit local conditions.

5.6 Training in selection of technological developments and equipment

International organizations should organize and conduct short intensive courses in this field for top and middle management.

6.0 RECIPROCITY IN INTERNATIONAL, REGIONAL OR SUB-REGIONAL
COOPERATIVE VENTURES

The preceding sections of this paper indicate that the bulk of cooperative or assistance arrangements must come from developed countries, particularly in the fields of technology transfer and project funding.

Negotiations between developed and developing countries have failed to materialize principally due to lack of equitable reciprocity between the negotiating countries. Because of the fact that development of the secondary wood processing industry usually carries a low priority rating in the economic development programmes of developing countries, the industry oftentimes does not carry the economic leverage needed to support its position during negotiations for external assistance. Governments of developing countries, therefore, will attain better success in seeking for foreign assistance by proposing terms leading to equitable reciprocity with the other country in sectors outside of the secondary wood processing industry. Technical cooperation among developing countries themselves also be further enhanced in this manner.

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