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THE SECONDARY WOOD PROCESSING INDUSTRY

Discussion Paper**

Prepared by the

UNIDO Secretariat

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

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CONTENTS

I. INTRODUCTION

1. The recommendations of the First Consultation on the Wood and Wood Products Industry held in 1983 in Helsinki, provided a programming framework for technical assistance projects, studies, meetings and seminars implemented by UNIDO as well as by other international organizations concerned with the development of the wood sector in developing countries.

2. In view of its potential in generating added-value for the producing countries, the secondary wood processing was considered as a priority area to be covered by the Second Consultation on the Wood and Wood Products Industry.

3. Against this background, preparatory work started in 1989 through the following activities:

(i) Linkages were established with other organizations within and outside the U.N. system, i.e., FAO, ITC, UNCTAD, ITTO, UNCHS (HABITAT), IUFRO and IIASA, to join resources and experience and avoid duplication of work.

(ii) A typological study on the wood sector was carried out to produce a framework for classifying developing countries with respect to their level and type of wood-based industries so that integrated technical assistance programmes can be developed that will be applicable to each group with relatively common factors. The study should be further developed to provide a structural methodology for characterizing the forest and wood industry sector in a country, (a whole country, part of a country or a group of countries), as a means of improving the direction of technical assistance.

(iii) Regional studies were carried out covering
a) Asia and the Pacific,
b) Africa,
the latter being a consolidation of three sub-regional studies on
- UDEAC countries,
- Eastern African countries,
- Cote d'Ivoire, Liberia, Nigeria, Ghana.

(iv) Two expert group meetings on the wood and wood products industry were organized, at the regional level for Latin America in Guarujà, Brazil, and at the sectoral level in Vienna, Austria. A number of country studies and papers related to specific areas of the wood industry sector were presented as background to these meetings. (A list is attached as Annex 1.)

(v) Within the limited resources available and with the support of other international organizations follow-up to the recommendations of the First Consultation was undertaken as follows:

a) In co-operation with IUFRO, a survey on research and development institutions in developed and developing countries is being carried out, aimed at identifying areas of existing and potential co-operation.

b) In co-operation with UNCTAD a study on maritime transport of wood was carried out covering Asia and West African regions.

The results of (a) and (b) may be presented at the Second Consultation.

UNCHS (Habitat), as a contribution to the joint Global Preparatory Meeting, prepared a study to promote the utilization in construction of commercially less accepted or secondary species.

Moreover, as follow-up to the Expert Group Meeting held in Vienna in December 1989, the Forest Products Laboratory, Madison, Wisconsin, U.S.A., assessed the availability of technologies to increase forest and industrial residues utilization in the manufacturing of wood products. This study may also constitute a background document for the Second Consultation.

II. SCOPE/FOCUS OF THE SECONDARY WOOD PROCESSING INDUSTRY

4. Three main fields represent the possibilities of further processing indicated as "secondary" in the wood processing industry sector, namely:

- Wood in housing and construction, including prefabricated wooden houses, housing components, bridges, engineered timber products and structures, temporary structures (shuttering), etc.

- Furniture and furniture components

- Other wooden products (boats, packaging, toys, etc.)

A. Wood in housing and construction

5. New construction is a requirement for most developing countries which, because of high population growth rates, need new housing as well as adequate transport systems. Shortage of building materials puts strains on a country's resources while the availability of suitable local materials, which do not require traditionally available skills in their use, is an asset to be considered in developing a strategy aimed at benefiting the lower income population as well as the modern construction industry.

6. The public sector's demand for construction is usually high as central or regional public authorities contract and finance public buildings, schools, hospitals. Governments also contribute to the construction of new housing for rural and urban areas. Building materials price, building regulations as well as transport of materials to rural areas are mainly determined and oriented by government socio-economic policies which can also encourage or hinder local production of these materials.

7. Materials such as timber and bamboo, which grow well in warm, humid regions are extensively used in developing countries for all the basic building components as well as fittings and fixtures of dwelling structures constructed by the low-income sections of the population. However, because of their organic origin, timber and bamboo may deteriorate quickly, entailing the constant repair of dwellings. Primary especies or first-grade timber are usually beyond the reach of the low-income population and secondary species of timber are not used as much as they could be. Factors such as prejudices against wood in construction, lack of machinery and know-how, inadequate skills, lack of regulations, codes of practice and technical manuals, as well as lack of research work, apply even more strongly to secondary species than to primary ones. The competition from other construction materials, all covered with ample regulatory instruments, poses a big limitation to the utilization of wood in general and more specifically of secondary species of wood.

8. The fact that these species are accessible and potentially available and may have technical merits as construction material, such as high density, is not enough appreciated by the processing industry, although the success story of rubber wood, which in Malaysia, thanks to research and promotion, has developed from a source of fuel wood to a competitive material for construction and furniture, is well known.

9. The first steps to be undertaken in the formulation of policies regarding the processing of wood products for the construction industry are: (1) an inventory of resources, (2) the determination of location of production facilities, (3) the determination of the scale of production, (4) adequate grading rules and (5) trained graders. Governments should then carefully review building regulations and standards to promote the use of appropriate technologies as well as the training of personnel in the characteristics and applications of new appropriate technologies.

10. Transfer of technology from developed countries is limited by the differences between temperate and tropical woods. The methodology, however, for assessment and classification of stocks could be easily transferred and so used as seasoning and preservation methods and design techniques.

B. Furniture

11. Wooden furniture usually represents 50 to 70% of total furniture imports of developed countries. Although furniture made out of tropical woods has been in high demand in those countries, its industrial or handicraft production is mainly carried out in the developed countries themselves which possess equipment, technology, skills and capital. Many of the above factors, basic to enter export markets, are lacking in many developing countries and their absence hinders the development of secondary processing of furniture.

12. The production of the furniture industry represents the higher degree of processing compared with other products of the secondary wood processing industry. To reach the increasingly sophisticated markets, careful attention must be paid to the following, in order to meet customer requirements:

- Design plays an important role since aesthetic considerations might even prevail over reliability.

- Finishing has to be carefully done as surface finishing gives colour and gloss and therefore influences the appearance of furniture.

- Quality control, which is important for competing on the market and meeting technical conditions established by relevant bodies. The variables which influence changes in quality of furniture range from the properties of raw materials to the precision and condition of components, quality of surface and durability of the final product.

- Marketing, since the demand for furniture depends on a number of socio-economic factors which range from consumer income to level of education and taste.

C. Other wood products

13. Under this general heading, products such as boats, household articles, toys, sport items, music instruments, packaging and art works can be included. For their purpose, size and markets, raw material, processing techniques, finishing, quality requirements, design, packaging for shipment or retail sale, the processing of these products broadly varies. Safety legislation for toys, health regulations for wooden household articles which may come in contact with food, and impermeability requirements for boats are specific features of the above products which deserve attention and careful study.

III. OVERVIEW OF THE SECONDARY WOOD PROCESSING INDUSTRY IN DEVELOPING COUNTRIES

Latin America

14. The development of the wood industry sector depends on the features of the forest resources. Within the complexity of the Latin American region, for example, different types of industrial development can be distinguished according to the forest resources of different areas which vary from natural conifer forests in Mexico and Central America, to broadleaf forests of difficult access in the great Amazon basin and industrial plantations in the temperate zones of Argentina, Chile, Brazil and Uruguay.

15. Despite the huge potential and the expansion of demand, the region's wood industry with very few exceptions is underdeveloped.

16. Information on secondary processing is more evidently lacking than on primary, the latter being the concern of forest authorities while secondary processing is scattered under several different government bodies.

17. With the exception of Chile, which has developed a relatively strong wood industry based on wood plantations, and Brazil, Latin American countries depend almost exclusively on natural forests.

18. Production and technological capacities are concentrated in a few countries of Latin America and in a few isolated operations. In the production of woodworking machines, Brazil is an exception since woodworking equipment for almost all segments of the sector, excluding very specific ones, is produced in the country.

19. Secondary wood processing industries, in particular, have to be boosted to generate new opportunities for employment considering that in the coming years the region will be required to meet a growing demand for wood products for the housing of an expanding population. Marketing problems as well mainly affect the secondary wood processing industry. For domestic markets it would be necessary to make wood products more competitive with other materials in building construction, by, for example, improving designs and increasing the efficiency of processing and distribution. For international markets, new marketing mechanisms must be encouraged and steps taken to facilitate the transportation of products which will raise their value-added price to cover the high transportation costs of wood products. Exports from small Central American and Caribbean countries are constrained by even higher transportation costs due to lack of regular shipping services.

Africa

20. Forest resources are unevenly distributed throughout the region; most

of the productive reserves are concentrated in Central Africa which has a total closed forest area of approximately 173 million ha. By contrast East Africa has a total closed forest of approximately 9 million ha., therefore, a very small natural forest but relatively large plantation area as compared to Central Africa. In between, West Africa has approximately 18 million ha. of closed forest area and some plantation activity.

21. As the development of the secondary wood processing sector is, to a large extent, dependent on raw material availability and supply, it is clear that if measures are not taken to ensure continuous supply of wood to processing industries, shortage will hamper the building up of the secondary wood processing sector. Tropical forests are currently being logged for only a few selected species, with many potentially usable species left unharvested. There is general agreement about the need to promote the use of commercially less accepted species, even more so now considering that some of the primary species are fast being depleted. Promotion of commercially less accepted species however, will require a deliberate effort from the producing countries since the logger will not extract them unless there is a demand. Their utilization on the local market will not only facilitate their export eventually but also liberate the corresponding volume of prime species, currently used locally, for export.

22. As far as the wood processing industry is concerned, two features have to be noted, namely that the primary processing industries are mostly controlled by foreign companies and secondly, secondary wood processing industries are not formally organized and consist mainly of small furniture and joinery enterprises operating at the craft or "mechanised craft" level.

23. Foreign investment in forestry and primary processing is a major policy question and its role varies from country to country. Concessions for logging and processing activities are granted by government agencies and it is estimated that in a country like Liberia up to 92% of such concessions were granted (1983) to foreign companies whereby local investment represented only 15% of the total.1/

24. The majority of logging activities are linked to overseas end-users of logs and tend to concentrate on removal of high value species. Consequently, the involvement of nationals in the management of the sector is insufficient and the influence of foreign investors makes it difficult for small local entrepreneurs to remain in a competitive position.

25. Being of relatively small scale, secondary wood processing industries in Africa face major problems related to production, marketing and

1/ Gillis, Malcolm, Meecher, M. & Peprah, I., Foreign Investment in the Forest-based Sector of Africa, 1983.

under-utilization of installed capacity, which is almost universal and mainly due to smallness of the market, poor design and quality of product, low productivity, breakdown of production machinery, lack of locally available spare parts, difficulty in finding technicians and lack of infrastructure.

26. Utilization of timber in housing construction is limited in spite of great housing shortages. Reasons for the above range from building regulations, general perception of low quality of timber housing to poor design, poor quality of raw materials used, lack of fire resistant linings and lack of carpentry skills.

27. If any, use of wood is confined to roofs, occasional parquet floors, false ceiling, doors and door frames. Prefabricated timber houses are produced in Kenya and exported to neighbouring countries. Transport costs and problems however limit their wider distribution. Modern trussed rafter techniques have not generally been introduced and in most cases timber standards are not available.

Asia and the Pacific

28. The Asia and Pacific regions encompass areas of temperate hardwood forests as well as tropical forests. In particular South-East Asia is known to produce a considerable amount of commercial timbers. Its forest resources are vast, with forest types ranging from tropical rain and mangrove swamps to savannah and evergreeen rain forests. Most forest resources in South-East Asia are accessible and exploitable, especially in Indonesia, Malaysia and the Philippines, where the forests tend to be quite homogeneous with valuable species in large quantities. With increasing restrictions on the export of traditional timber species in log form from timber surplus countries of Asia, further R and D will have to be devoted to determining ways and means of using commercially less accepted species.

29. Countries with abundant forest resources naturally have a favourable precondition for the development of the wood industry. The lack of natural resources should not, however, deter a country from developing a particular resource-based industry. This point is evident in the Asian region. While resource-rich South-East Asian countries such as Indonesia, Malaysia and the Philippines have thrived on their forest products, the area of Hong Kong, the Province of Taiwan and the Republic of Korea, all with no forest resources whatsoever, also manufacture forest products for export, primarily by importing the raw material from the resource surplus countries and then processing them for a higher value-added.

30. The above shows that when it comes to secondary wood processing, other dynamic factors such as capital, access to markets and technology rather than

the static concept of resource supply come into play, thereby making it possible for the resource-poor countries to start their own resource-based industries on a competitive basis.

31. In general, the secondary wood processing industry has shown a significant shift during the last decade from the craftsmen system to the mechanized techniques of production operations.

32. As a result of depletion of traditional timber species, more intensive use of minor forest products, such as rattan and bamboo, in the manufacture of furniture items was made during the last decade. The rubber tree which only a few years ago was considered as an agricultural waste and not even mentioned in the list of secondary timber species was also increasingly used. Its potential was ignored for a long time but its increased use in the last few years has demonstrated that its processing is feasible.

33. As far as the construction industry and the utilization of wood as a building material are concerned, the first factor to be considered is the climactic conditions of the region such as strong winds and typhoons. Other factors relate to the acceptance of wood as a standard building material in the building codes of most countries in the region. Within the same framework an important role is also played by insurance and financing conditions that cover the financial aspects of housing projects. The proper design considerations, choice and effective use of timber preservatives, finishing materials and painting techniques should be studied more intensively so that the banking and insurance requirements for desired lengths of service life of timber used in construction are adequately complied with. In spite of the fact that the dwindling supply of traditional timber species has led to the use of commercially less accepted species, these are for the majority not yet approved for inclusion in the building codes. In general the use of wood in housing and building constructions is constrained because of the lack of knowledge about the structural and physical properties of the species available on the local timber market.

IV. CRITICAL FACTORS IN THE DEVELOPMENT OF THE SECONDARY WOOD PROCESSING INDUSTRY

Strategies and policies for the integrated development of the subsector: raw material availability

34. Most of the world's timber originates in publicly-owned forests with timber cutting rights and responsibilities transferred to individual enterprises by means of timber concession contracts. The timber concession holders include a varied mix of firms both small and large, national and foreign, private and public. The relations between government and wood

processing industries are often adversarial rather than co-operative as the wood processing industry must cope with multiple restrictions, policies and revenue claims that sometimes develop in an ad-hoc fashion.

35. However, some policy options have been open to increase wood industry earnings from timber-based exports.

36. The first option simply aims at increasing total export volume. This strategy is most relevant for timber-rich countries but it is least satisfactory for timber-scarce countries.

37. The second option is precisely the opposite: restrict log exports. A principal condition must be met for this strategy to be effective, namely, governments of producing countries must be able to reach unified agreements on log export quotas and prices.

38. The third strategy is to increase the proportion of secondary processed wood in the total timber-based export mix.

39. The governments of the timber producing countries in Asia have indeed chosen to pursue the latter two strategies imposing log export bans.

40. As far as secondary wood processing industries are concerned, exporters usually face higher tariffs on export of processed wood products than on export of logs. Governments might further penalize the export of processed wood products by their "inward-looking" macroeconomic policies of trade and development by which equipment, spare parts, resins and other imported inputs are costly and difficult to obtain due to bureaucratic procedures, unfavourable currency exchange controls and other protectionist measures.

41. However, obstacles impeding the growth of exports of secondary wood products do not only relate to political and administrative policies but also to technical factors such as capital investment, market and human resource development.

42. Some examples which will be analyzed in the following chapters are:

- Costly transport infrastructure. This refers to scattered shipping points, costly in-land transport and inefficient port handling and storage. The result is high unit freight costs.

- Use of wood residues. Large integrated processing complexes are able to make almost total use of the logs arriving at the plant. Utilization extends to the residues left after primary processing thus helping to recover the high fixed costs of logging and subsequent log transport to the complex. However,

integrated processing facilities are the exception rather than the rule in view of constraints posed by high levels of capital investment and marketing organization to sell the products. On the other hand, some mills use waste to produce and sell blanks to the furniture industry without being formally integrated.

43. To counteract the above political and technical constraints, investment and trade strategies can be formulated aimed at:

a) Securing raw material through expanded use and marketing of secondary species in view of the fact that even in relatively timber-rich areas, high quality logs of the primary species are becoming increasingly scarce. The above implies modifications of products, technologies and markets.

b) Improving operational efficiency through waste utilization and product quality control.

c) Addressing the domestic markets which are expanding rapidly in the producing countries, adjusting production lines and marketing efforts.

Technology selection - Manpower development at all levels

44. One important issue facing governments of developing countries is that of technological choice. The question of how existing natural resources, labour, capital and skills can best be combined to counteract unemployment problems and provide a stable base for a future increase in the standard of living is a complex but crucial one.

45. The industrialization process in developed countries cannot simply be copied in developing countries, though for the modern subsector, both domestic and international, it could be a basis for the choice of appropriate technologies. Besides, the technologies used in developed countries cannot be considered appropriate for developing countries because of the scale of production. In the traditional domestic sector appropriate technology has a different meaning. Here the decisive factors are small scale, capital investment and the maximum use of local resources. Technical solutions applied in developed countries often lead to inappropriate technologies for the small-scale domestic industry. Therefore other solutions have to be found or existing ones adapted to local circumstances. Often there is not just one appropriate technology for one product. On the contrary, several technologies can be considered to be the most appropriate at the same time, depending on the scale of operations and other factors.

46. An industry, for example, designed for utilization of wood raw material from a natural forest may find it difficult to utilize

plantation-grown wood by the time the plantations are ready for harvesting. One reason for this may very simply be that the industry in the technological planning phase has neglected to take into account the foreseen change in type of raw material. The equipment selected for the mill, although ideal for the type of raw material used initially, may not be suitable for the raw material available in the second phase, when plantation-grown wood is available.

47. Technical skills are also needed throughout the production flow because the value of the material is very high. Balanced attention should be given to sawmilling, wood-based panels technology and secondary wood processing. Specialized training services should be provided for training of key personnel such as mechanical engineers, wood technologists, industrial engineers, mechanics, saw doctors, machine operators and maintenance mechanics, graders and quality controllers, accountants, production supervisors and managers.

48. Lack of managerial skills reflects in underutilization of production capacity. Whatever the degree of complexity of the wood processing industry, without competent management it will be practically impossible to ensure a satisfactory yield and consequently the continued existence of the industry.

49. Also in supervisory tasks, which are normally the responsibility of technicians, training is of vital importance. Adequate training of the supervisors is all the more important when they are responsible for training instructors and/or skilled and semi-skilled workers to provide a multiplying effect in expanding knowledge and acquiring new technical skills. A special problem arises in the training of skilled workers. Wood processing industries are not always included in the national training systems drawn up to meet the personnel needs of the development plans so that practical responsibility for this aspect is left to the industrial sector itself. This staff is therefore trained on-the-job and the quality of the training obviously depends on the quality and technical ability of the trainers and on the technical and operational level of the enterprise or industry.

50. Finally, it can be concluded that human resource development plans in the wood processing industry can only be implemented if there is co-ordination between the industry and the public sector responsible for the wood processing sector development and for training, resulting in a human resources development programme appropriate to the development of this sector.

Entrepreneurship

51. In addition to suitable laws, certain institutional factors can predispose a development plan toward success. These are, for instance, efficient government facilities and well-organized entrepreneurial firms. A key issue of institutional development relates to increasing local people's

participation in and benefits from wood processing through technical assistance and other inputs, at least initially, to enable them to take on responsibility and tap the benefits.

52. Promotion of entrepreneurship requires suitable incentives as well as training for them to effectively discharge technical, managerial and marketing tasks on their own.

53. The organization of small-scale industries into associations is usually best to pool efforts and enhance chances of success. Formation of such entrepreneurial associations should thus be a priority function which official and non-governmental agencies should assist in implementing.

54. Specific arrangements such as service and repair facilities, provided as a kind of indirect subsidy to small-scale industries by public authorities, operate as co-operatives or as independent firms and supply common facilities for the repair and servicing of tools and machinery to a number of small firms. For reasons of economy of scale it has also proved advantageous to establish common specialized facilities for wood drying and preservation.

55. Another problem which requires attention is the problem of poor management capabilities of entrepreneurs who cover functions ranging from creation of the enterprise, identification and timely procurement of inputs, organization of production, market identification and marketing.

56. The principal contrasts with management of larger scale operations are that in small-scale industries all or most of these functions are carried out by the entrepreneur who has to combine management with being a worker in the enterprise and that, while appropriate systems have been developed for large-scale industry, entrepreneurs must work only by intuition and without benefit of elaborate data.

57. It is therefore necessary to develop packages geared to these particular needs and characteristics. In some instances however, the amount of assistance poses the danger of stifling private entrepreneur initiative. In developing better systems, emphasis should be on giving the entrepreneurs more information on the basis of which they can make correct decisions.

Transportation/Markets

58. Serving export markets requires very sophisticated and timely world market intelligence, something which is sometimes lacking in developing countries. It is in fact extremely important in export marketing to develop a reputation for reliability with respect to quality, pricing and the financial aspects of sales.

59. The creation of new wood processing industries and expansion of existing ones must be based on knowledgeable and realistic forecasts of markets and the competitive position of the enterprises on these markets.

60. The selection of products and technology for their manufacture is by necessity governed by the market requirements. Local or domestic markets often provide an outlet for products which are competitive with imported ones.

61. Domestic markets may also be less demanding and thus accept products made from raw materials which do not meet the requirements of export markets.

62. Timber species which might not be suitable for exports could be the basis of raw materials for the domestic market, where the need for species of high value and high processing value is not as great as in the export trade.

63. On the other hand, export markets although highly competitive, provide important foreign exchange earnings. These markets, however, present considerable fluctuations and a mixed market of both domestic and export may provide more stability for the sale of wood products.

64. One of the major handicaps to the growth of manufactured wood product exports from developing countries is the cost of transport and its influence on the final cost of products.

65. Wooden furniture, for example, usually consists of bulky items that are heavily affected by freight rates because of their volume of weight. Given the expenditures involved in shipping, one of the key questions is whether they can be reduced by improving or rationalizing shipping services.

66. There seems to be scope for different action to improve the present situation, for example by assisting developing countries in their negotiations of freight rates or by the development of transport cost saving methods. Port infrastructure and efficiency of operations will also have to be developed to handle semi-manufactured and manufactured products.

67. Within this framework, extensive development of the container type of sea transport during the last decade has provided a tremendous boost to the export of manufactured wood products from Asia to the traditional markets of Europe, the USA and Japan.

68. The African wood processing industry suffers a severe handicap compared with the Asian industry both in local transport to reach shipping harbours and sea transport to serve the main overseas markets from these loading fares.

69. It is well-known that, with very few exceptions, processing activities in Africa are increasingly remote from the coasts and shipping harbours,

whereas such distances are much less in Asia. Local transport also presents problems relating to irregularity of operations linked with river flows, erratic railway networks, poor road conditions, safety hazards over exceedingly long distances and possible losses. A combination of these various handicaps results in considerable financial cost to the company which has to bear them and eventually include them in its final products cost.

Environment

70. Increasing attention is being given by governments and the international community, to the conservation of forest resources and environmental aspects of forestry and the wood processing industry in view of the current magnitude of deforestation and the resulting depredation of the natural resource base, particularly in fragile ecological situations. The total area of closed forest in the world is estimated at 2,500 million ha. Tropical forests extend over an area of about 1,935 million ha of which 1,200 million ha are closed forests and 735 million ha are classified as open tree formations.2/

71. The rate of deforestation for both closed and open tropical forests is estimated to be some 11.5 million ha per year. Reafforestation and afforestation help to offset the loss but only amount to approximately one-tenth the annual rate of deforestation. The quality of the regenerated forest is generally inferior due to the normal range of species used and the common use of poorer land. However, some of the functions of natural forests such as erosion control can also be performed by man-made forests.

72. Deforestation and the deterioration of the forest ecosystems have driven some animal and plant species to extinction with a loss of corresponding genetic resources. This is aggravated by the selective character of deforestation which has brought about the almost total elimination of certain forest types such as the humid forest along the eastern coast of South America.

73. Removal of the forest cover in the tropics leaves behind a habitat with soil vulnerable to further loss. Historically, forests were subject to cutting and were often menaced with fire. But today forests are threatened by different environmental hazards. The temperate-zone forests are afflicted by industrial pollution while the tropical forests are subject to depletion through excessive cutting and shifting agriculture that is not compensated by afforestation.

2/ Tropical Rainforest: A Disappearing Treasure (Smithsonian Institution, Washington, D.C., Travelling Exhibition Service, 1988) and Gradwohl and Greenberg, 1988.

74. Apart from wood products collected and consumed at home, wood products represent an important export item for many tropical countries. The trade value for forest timber exports is about US$ 4.7 billion a year. Depletion of forests is changing the global trade pattern and exports are subsiding, especially from tropical Africa.

75. The Tropical Forestry Action Plan published in 1985 by the FAO's Committee on Forest Development in the Tropics, identified five priority areas for action aimed at the development and conservation of tropical forest resources: forestry in land use, forest-based industrial development, fuelwood and energy, conservation of tropical forest ecosystems and institution building.

76. The plan, which is being updated to stress the importance of involving forest dwellers in the design stage of forest projects, tries to encourage countries to manage their forests in a sustainable manner - cutting trees selectively and planting new ones to ensure further supplies. Forest-based industrial production can benefit both local and natural economics, provided that new approaches are adopted for improved resource management and industrial development where old concepts have failed or proven too limited.

International Co-operation

77. In light of the growing economic interdependence of the world, international industrial co-operation is the key not only to the continuing growth of international trade but also to the overall success of world industrialization efforts.

78. In a context, however, of a deteriorating international economic environment such as during the 1970's, when a series of global economic crises occurred, developing countries, which were more than others hit by oil price adjustments, felt vulnerable and showed increasing inclination to seek greater self-reliant patterns of development.

79. When national self-reliance was often too unrealistic a policy to pursue, self-reliance on a regional basis seemed to be an acceptable alternative. Hence the crisis period of the 1970's witnessed renewed attempts by groups of developing countries towards regional economic co-operation or integration.

80. In spite of the above efforts the expansion of trade in manufactures between developing countries is often limited by their lack of industrial complementarity, internal tariffs and by the fact that the export markets for major industrial commodities, such as timber and timber products, are extremely competitive and tend to be dominated by the industrialized countries.

81. One effective means of promoting regional trade in secondary wood products between developing countries is regionally co-ordinated measures to increase their industrial complementarity. Countries like the Asian countries which have been undergoing rapid structural changes in response to domestic and international challenges have promoted export industries and developed programmes aimed at fostering industrial co-operation at the regional and sub-regional level.

82. An example of the above is the ASEAN Industrial Complementation (AIC) Programme aimed at facilitating the rationalization of existing industries, particularly medium and small-size industries, through complementation to take advantage of the enlarged regional market. An industrial joint-venture programme not necessarily limited to ASEAN countries, has also been developed for the purpose of regional co-operation.

83. In Latin America, the Cartagena Agreement covers technological policy for the subregion of the Andean Pact and provides for the establishment of the Andean Programmes of Tehnological Development.

84. The above programme has set up, among others, the Andean Forest Project with a view to conducting research and disseminating knowledge regarding timber and other forest resources in the subregion. Work on testing various forest species has been carried out and new technology for timber exploitation has been developed. Specifically, the Andean Laboratory of Wood Engineering was founded in Lima and the Andean System of Classification of Structural Wood was developed.

85. The need for greater regional co-operation in Africa is becoming more urgent now that trade discussions between Europe and Africa, in view of the 1992 Single Market, have started.

86. In order to benefit from the changing commercial climate, Africa should develop strong regional markets since, without them, it will not be organized on a sufficient scale to become an area of economic growth.

87. In this context regional organizations such as the African Timber Organization which operates as a focal point to collect, process and deliver industrial information generated in the African timber producing countries, are vital to ensure accumulation of experience, concentration of resources and smooth relations between regional and national policies.

V. CONCLUSIONS

88. The further development of the secondary wood processing sector in developing countries could generate new jobs, increase income and improve living conditions.

89. Moreover, when the export market is considered these benefits could be expanded to include foreign currency earnings and opportunities to produce a wider range of products. In particular, exports could provide the outlet for high value-added products.

90. The secondary wood processing industry, which also includes wood used in building and construction, forestry and primary wood processing industries, shares a mutual interdependence. Accordingly, the development potential of the secondary wood processing sector is greatly dependent on the conditions of the upstream sectors. Plans and policies must therefore take into account the objectives of ensuring that forest resources are properly managed and that a continuous and reliable supply of wood raw materials is made available for man's use. The wood processing industry should accordingly place greater emphasis on a more efficient use of the existing forest resources by:

- Promoting the utilization of secondary species for construction and manufacture of furniture and other wood products as a means to increase returns from forest management and at the same time achieve sustained yields;

- Promoting existing technologies and developing new technologies to reduce waste and improve waste utilization;

- Strengthening or creating manufacturers and trade associations as well as an autonomous institutional infrastructure which, as has been illustrated by a number of Asian countries, would support the development of secondary processing for both local and export markets;

- Increasing the use of wood, particularly secondary species, in construction.

ANNEX I

LIST OF DOCUMENTS

The Development of The Secondary Wood Processing Industry	IPCT.94 (SPEC)
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