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THE DEVELOPMENT OF SECONDARY WOOD PROCESSING INDUSTRY
IN DEVELOPING COUNTRIES: POTENTIAL AND CONSTRAINTS*

Prepared by the
UNIDO Secretariat

* This document has not been edited.

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1) Raw Material Resources

1. In the developing countries the disparity between the availability of wood resources and their secondary processing in-country is large and may even rise unless steps are taken so as to obtain an increase in value added to meet rising domestic demand and to generate surplus for export.

2. The concept of value added is defined as the difference between the value of the output and the cost of the materials used to produce it. Many developing countries producing commodity items such as timber, the price of which is determined by market forces beyond the producer's control, could face declining economic returns due to diminishing and more costly resources (e.g. plantations) unless they adopt a policy aiming at increasing the value extracted from the logs.

3. Measures to achieve the above objective include a) changes in the product mix towards more processed products; b) adoption of technologies that improve yield and productivity and that replace traditional raw materials with, both in commercial and ecological terms, less valuable resources. These technologies can be considered resource-driven because a major factor leading to their adoption is a change in the raw material supply.

4. Within this context the development of secondary wood processing industry cannot be seen as an isolated event but is closely linked to changes in technology, social environment and supply situation of raw material. Advances in indirectly related areas such as mechanical engineering and chemical industries provide impetus to the development of secondary wood processing as well as the changing character of raw material sources.

5. While some years ago, and still today in many tropical countries, timber harvested was mainly of primary, well known "traditional" species, the heavy logging of these forests should increase the use of secondary species to provide new opportunities for more economical total resource utilization. In developing countries, however, increased knowledge about mechanical properties of secondary species has still to be promoted. Further new opportunities for the use of plantation species and others such as Rubberwood need to be developed.

6. Raw material shortages linked to supply and access to sources particularly affect small scale wood processing industries which in developing countries are an important part of the overall wood industry sector. Forestry regulations and lack of working capital, limiting the flexibility of small scale enterprises in buying when supplies are available and holding stock for periods of shortage, are major constraints to the development of the sector which policy makers should consider in bringing about policy changes.

2) Environment

7. Environmental policies today have to satisfy a public that is becoming increasingly conscious of environmental problems. International organizations like UNIDO share worldwide concern about the future of tropical forests which is critical to a balanced world environment.

8. The major pressure on tropical forests is widely recognized as human population expansion and the resulting need for land for food production, fuel, and employment. The reduction of natural tropical forest area is mainly the result of shifting production, establishment of new farming communities and firewood production. 86 per cent of the quantity of wood harvested in tropical rain forest is used as firewood and only 14 per cent as utility timber.

9. Properly managed, the tropical forests are a renewable resource. Many producing countries recognise this and have in place policies directed at conservation and proper use of the resource both to meet domestic needs and to provide export income that contributes to their own economic and social well being.

10. Within the above framework policies aim at:

- a) Developing new markets for lesser known species by means such as sampling, testing and promoting the above species;
- b) Minimizing timber losses through use of optimum recovery techniques. The above techniques consist of a more complete utilization of tree stems removed from the forest as well as of wood left-over in the form of branches and unusable stemwood. So far, however there is almost no management concept for forest residues which are generally removed through useless, environmental unsound, on-site burning. Similarly under-utilised are the wood residues which accumulate during the processing to products of various kinds (lumber, furniture parts, construction elements).
- c) Promoting improved utilization through the use of better grading measurement systems. Considerable problems with respect to improving wood utilization however arise from the fact that the quality requirements on finished products in terms of standards, building regulations and market requirements are very different in various countries. Harmonization of the above requirements is therefore a basic step to achieve the desired results.

3) Utilization of waste

11. A large portion of the tree felled during logging operations is wasted before reaching final utilization. This is attributed principally to poor logging methods and unfavourable economic conditions, that is, failure to determine a profitable outlet for waste in logging and manufacture.

12. However, more and more manufacturing losses are being reduced either by improvements in conversion processes or by increased utilization of waste. Integrated utilization, which is a combination of several uses from a given tract of timber, or varied uses of the primary product of log, has marked the developments consisting of: 1) increased manufacture of small wooden parts such as brooms, handles, toys from slots and edgings; 2) installation of crating factories in connection with sawmills and other wood-using industries; c) increased use of hardwood small squares and pieces of short lengths for furniture components and small woodware.

13. Besides, some logging waste which has so far been left in the forest to rot could be utilized for low-cost housing given the economic climate that would make its processing financially feasible. Some raw materials that could become available from the logging waste, as well as new resources derived from plantations share the same characteristics of being small in diameter. The technology for economical processing of these materials is well established however it requires the use of appropriate processing, preservative treatment and drying methods. Furthermore, specific designs for low cost houses should take into account the dimensions of lumber and panel products that can be produced from small diameter trees and tree top and branches.

4) Technology

14. Technological advances, new drying and preservation techniques, strength properties measurement make possible for wood to compete with other material such as plastics, aluminium and composite material and lead to its more economic use as well as to lowering costs of production.

15. In developing countries secondary wood processing industry still has to adapt to the recent developments outlined above. Besides, as far as technology adaptation is concerned, the secondary wood processing industry in developing countries lags far behind its counterparts in developed countries.

16. In this connection it is worth mentioning that production technologies cover all phases involved in the manufacture of wood products, starting with the procurement of raw materials up to the time the products leave the factories. Plant layouts and process flow have to be analysed in accordance with the succession in the stages of the operation. Technology needs of immediate significance in secondary wood processing industry concern:

1. wood seasoning
2. timber grading
3. wood machining
4. plant layout and automation
5. production planning and cost control
6. quality control
7. equipment maintenance

17. Other main thrusts of technological development aim at conservation of energy and reduction and control of environmental pollution. Major consideration is thus given to environmental effects of preservative treatment.

18. A trend which also warrants special attention is towards composite products for their flexibility in raw material utilization. Combinations of wood with glass fibers, polyester fibers and other non-wood materials is consequently growing in interest and possibilities.

19. Adequate consideration must, however, be given to the technology absorption capacity of wood processing industries in developing countries, considering the high percentage of small scale industry operating in the sector. In this connection, emphasis should be given first to improving managerial and organizational capabilities as well as technical skills in view of a more technological, capital-intensive production. Subcontracting, where possible, could offer good possibilities for transfer of technology between large and small enterprises although large industries are often reluctant to provide essential production technologies to small firms. The same applies to the relationship developed/developing countries. Technology export restriction regulations and the other barriers to technology acquisition are relating to high prices of technological inputs often beyond the financial capabilities of developing countries.

20. Technology, however, can also be developed locally provided that government programmes are formulated with the objectives of developing technologies and encouraging their use, both at enterprise and institutional level, through the support of research institutes, training institutions, development banks.

5) Construction industry, furniture and others

21. Two major areas are served by the secondary wood processing industry, namely:

a) building and construction

b) furniture and other uses such as sport items, musical instruments, decorative objects, etc.

22. Generally speaking up to now the share of furniture, components and builders' wood work 1/ from developing countries has been fairly insignificant in total industrialized countries demand.

1/ The added-value products falling into the builders' woodwork category comprise doors, moulding, headings and trim, windows and flooring. New products or extension of previous designs such as shelving systems and wall panelling are also included in this group.

23. In the area of structural wood quality standards are becoming more rigorous and more critical. From the consumers perspective, the value of a structural product is based on its ability to meet strength and stability requirements for a desired application at a minimum cost.

24. Increasing competitiveness and changes in structural material markets between wood and non-wood products and increased interest in the use of wood for housing in many parts of the world that are subject to earthquakes or severe wind and rain storms, determine the importance of research which can provide essential information and can set and meet quality standards.

25. Determination of the performance of wood, its reliability and durability are necessary requirements for rational and competitive use of timber in building and construction industry so as to enable the application of standards and specifications.

26. As far as furniture is concerned, developing countries should give careful consideration to the export market issue before attempting to develop export industries for which styling, quality, finish, packaging, shipping and distribution appropriate to developed countries markets are more important and completely different from the same matters applied to domestic markets. One special feature of the furniture industry is that its products represent the highest degree of processing compared with the products of other secondary wood processing industry.

27. Between raw material and finished products, drying and preservation techniques constitute an important link and are indispensable for all applications in which wood can be in danger. The same applies to the protection of wood surfaces against deterioration through finish and to mechanical processes such as reconstitution of wood and assembly methods.

28. Technology is one of the main factor contributing to the achievement of those qualities the consumer requires. Guaranteed performance, reliability and durability reached through automation, computer assistance, electronic aids are essential market assets and make the end product competitive. Seasoning processes in drying chambers or drying kilns, preservation methods for timber, including some impermeable tropical timbers, surface protection and finishing techniques, machining reconstitution of sawn wood, adhesives as well as stress grading (visual and mechanical) are the basic technological steps which have to be improved to obtain the best from existing equipment and labour force.

6) Integration

29. Forest operations and wood processing operations should, in general, be considered as inter-dependent operations. In quite a few cases in fact there appear to be possibilities for processing of the best species and tree parts into solid wood products, using the remaining tree parts for energy.

30. Integration in forest industries can be horizontal (the combination of several primary wood processing operations) or vertical (the combination of successive stages of production).

31. When sawmills or plywood mills are combined with particle board and fiberboard mills, better use of the available wood raw material is obtained which reduces wood cost. Vertical integration may be achieved through expansion into joinery or furniture industries. There are however, technical and market reasons why, with few exceptions, only limited integration in this direction has taken place. Financial integration through ownership links has sometimes proven to be a more attractive alternative than physical integration as well as a rationalized chain of conversion/supply within a country, i.e., smaller units working independently but together comprising an integrated sector.

7) Human Resources Development

32. All the above factors are however closely related to the development of human resources for better utilization of natural resources.

33. Wood industry is becoming more technical and mechanized, which implies that those who work in this industry will need to continually upgrade their knowledge and skills in such areas as proper machine selection, maintenance and operations to get the best return from each equipment investment.

34. In order to result in increases in productivity, better processing, more productive machines and better plant design have to go together with better organization and management of production. This implies, among others, determining the kind of products to be sold, deciding whether to buy semi-finished parts or produce them in the factory, in one word integrating all of the production-related activities of the various functional areas towards the aims of production management.

35. Lack of technical infrastructure and skilled personnel are the main problems hampering the development of secondary wood processing in developing countries. Timely planning of human resources development as well as appropriate training programmes, are essential components of developing countries policies aimed at fostering secondary wood processing. In this connection it is worth mentioning that in many developing countries, wood being a raw material which has been used for centuries, a nucleus of skilled carpenters and other woodworkers often exists. Up-grading of small-scale factories can be part of a meaningful human resources development programme aimed at fostering handicraft skills towards industrial skills.

8) Markets

36. The influence of social changes in the market of wood and wood products has also to be considered in any forecast of future developments of wood industry.

37. Demographic patterns (urban versus rural, low cost housing, single or family houses), consumer taste (natural versus synthetic, handicraft products or industrial products) environmental factors, have to be taken into consideration when production is planned to meet local or export requirements.

38. In this respect two main trends may be postulated:

- As far as the demographic explosion and urban sprawl will permit, human beings in most places might prefer individualized dwellings to large blocks of communal flats. Timber may be a preferred building material for single houses for one or a few families if it can meet consumer expectations as regards cost and reliability. In regions where timber is not at present readily accepted for housing, sociological and marketing research should be encouraged to identify relevant promotional techniques.
- In the industrialized countries and in the increasingly crowded environment of the next century, many people will wish to surround themselves with "natural" rather than synthetic or artificial materials, and wood may be a first choice for furniture, interior decoration, and articles of utilitarian or cultural use, if ways are found to enhance and conserve its natural beauty by appropriate surface treatments, dimensional stabilization and new conceptions of form.

9) Investment and financial resources

39. More attention should be paid to the key development issue of how to use best such public financial incentives as direct payments, tax rebates and credit to speed the growth of the wood sector.

40. Such incentives are necessary if governments want rapid development to contribute to national economic development. In distinguishing between the availability of funds and access to them by public or private wood enterprises it seems that the major impediments to increased investment in the wood sector are access problems and perceived low rates of return.

41. Besides, a number of aspects must be kept in mind while considering investment alternatives:

- (1) Profitability. What is the return on investment?
- (2) Uncertainty. How does profitability depend on future uncertainties concerning demand, prices, and costs?
- (3) Time preferences. When are the profits realized?
- (4) Liquidity. How can the investment expenditures be covered?

- (5) Economic impacts. What are the effects on employment and GNP?
- (6) Environmental impacts. What are the effects on air and water quality, as well as on the forest ecosystem?

10) Conclusions

42. To conclude, for a successful improvement of wood processing industry in developing countries some basic requirements have to be met:

- a) The use of plantation forests and secondary species may replace decline in quality and quantity of traditional wood resources. This will require acceptance of different technology.
- b) Operational efficiency of domestic industry should be improved if comparative advantage is to be increased. To this aim integrated plants may offer economical and technical advantages
- c) The requirements for manufacturing wood products for the export market are more stringent than those for the home market. The above should stimulate modernization and innovative activities. However, the importance of domestic markets has to be recognized since they grow rapidly in many developing countries. Local production should become more competitive than imported products.
- d) Institutional infrastructure, ranging from research and development institutions and human resources development centres to market information and promotion organizations and small-scale industries, has to be strengthened to create or improve the necessary environment for the development of secondary wood processing industry.