# Working Paper

**PROBLEMS AND PROSPECTS OF DEVELOPING COUNTRIES IN FORESTRY AND WOOD-PROCESSING INDUSTRIES**

**REPORT FROM AN IIASA/UNIDO WORKSHOP**

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Wolf D. Grossmann
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June 1983
WP-83-55

International Institute for Applied Systems Analysis
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## FOREWORD

The objective of the Forest Sector Project at IIASA is to study long-term development alternatives for the forest sector on a global basis. The emphasis in the Project is on issues of major relevance to industrial and governmental policy makers in different regions of the world who are responsible for forestry policy, forest industrial strategy, and related trade policies.

The key elements of structural change in the forest industry are related to a variety of issues concerning demand, supply, and international trade of wood products. Such issues include the development of the global economy and population, new wood products and substitution for wood products, future supply of roundwood and alternative fiber sources, technology development for forestry and industry, pollution regulations, cost competitiveness, tariffs and non-tariff trade barriers, etc. The aim of the Project is to analyze the consequences of future expectations and assumptions concerning such substantive issues.

On January 27, 1983 a joint workshop between UNIDO and the Forest Sector Project at IIASA was organized to discuss the substantive issues related to long-term development possibilities of forestry and forest industry in less developed countries. The purpose of tis paper is to summarize the discussions of this workshop, which had participants from Brazil, Canada, India, Indonesia, Japan, Malaysia, Phillippines, Venezuela, and USSR, as well as from UNIDO, FAO, and IIASA.

Markku Kallio
Project Leader
Forest Sector Project

**ABSTRACT**

This paper reports in a summary form on the discussions during a workshop organized by IIASA and UNIDO in January 1983. The workshop treated problems and prospects relating to developing countries in the sectors of forestry and wood-processing industries. The results of the workshop will be used in IIASA's project "Structural Change in the Forest Sector" and in UNIDO's work on its world-wide study on wood and wood-processing industries. The invited participants came mainly from developing countries and from the two institutions mentioned.

The issues raised during the meeting are summarized systematically in Figure 2. The main concern of the meeting related to the sustainability of the wood resources, over-exploitation and depletion and suitable counter-balancing measures, such as afforestation, reforestation, and more efficient use of available resources. Trade patterns were also discussed. A global trade model for forestry industry products was presented.

**CONTENTS**

# PROBLEMS AND PROSPECTS OF DEVELOPING COUNTRIES IN FORESTRY AND WOOD-PROCESSING INDUSTRIES

## REPORT FROM AN IIASA/UNIDO WORKSHOP

Sandra Buckingham, Ann Francescon,
Wolf D. Grossmann and Lars Lönnstedt

## 1. INTRODUCTION

The workshop concerning problems and prospects relating to developing countries in the sectors of forestry and wood processing industry was jointly organized by the International Institute for Applied Systems Analysis (IIASA) and the United Nations Industrial Development Organization (UNIDO), see Appendix 1 for the agenda and list of participants. This report gives a short summary of the discussions at the meeting. IIASA's project "Structural Change in the Forest Sector" will use the information from this meeting to further develop its collaboration with developing countries for national and global forest sector analysis. Many of the issues raised will also be dealt with in UNIDO world-wide study on wood and wood-processing industries.

Many issues were raised, describing a variety of problems, both complex and fast changing. As one participant from an international agency remarked, in a similar conference last year, "the chaotic behavior of the market" was seen as the main problem, whereas now most conference participants were mainly concerned about sustainability of the resource, over-exploitation, depletion and some possible cures such as reforestation, afforestation, and more efficient use of the available resources particularly wood wastes. Consequences of destruction of forests were widely discussed, particularly with respect to the impacts on ecology, the economy, and society. For some countries, however, possible depletion of the forest resources was not of concern. Brazil with its vast resources instead wants to promote use of wood and other biomass for totally new purposes; for example, production of fuel liquids etc. In Figure 1, the

main areas of discussion in the conference are depicted. Appendix 2 is a list of issues raised by the participants from the developing countries. In the next chapter, the issues are summarized and grouped into (i) *Societal and Environmental Problems* and (ii) *Economic Problems*.

## 2. PROBLEMS

### *Societal and Environmental Problems*

Although many problems change rapidly, some basic problems remain the same over a long time. In developing countries, most wood is used for fuelwood. According to FAO summaries, total wood consumption in 1980 for developing countries was 1.77 billion cubic meters, of which 1.48 billion cubic meters were used as fuelwood. That means, 83 percent of the total consumption of wood in developing countries is for fuelwood. The consumption of fuelwood in developing countries alone is even higher than the total consumption of industrial wood (1.39 billion cubic meters) in both developing and developed countries together (extracted from FAO 1982).[1] The demand for fuelwood in developing countries is increasing very rapidly due to population growth, and the high costs of other energy sources. Demand now often exceeds regrowth. The very first report from FAO from 1948 (FAO, 1948)[2] gives the same ratio of consumption and over-exploitation, but at that time the consumption was much lower.

As fuelwood is mainly a noncommercial product, it generates no income to pay for reforestation, not to mention afforestation. Population pressure, increasing demand for agricultural land, and over-intensive shifting cultivation are causing steady decline in land available for forestry.

### *Economic Problems*

Demand for commercial forest industry products is (thought to be) affected by factors such as a) national income per person, b) population size and c) prices relative to substitutes. Income changes should affect the demand more in developing countries than in developed countries, where consumption level is already high. Developing countries may not follow the patterns of the consumption development observed in developed countries because modern substitutes for forest products may be cheaper. For example at comparable income level they may use less forest industry products and more substitutes such as plastics, steel, aluminum, bricks, and concrete.

Substitution is also possible between different forest industry products, for example, between plywood and particle board in Japan. Demand is also affected by technological development for example reduction of the required amount of wood raw material per unit of product (e.g., thinner paper).

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[1] FAO, 1982. Yearbook of Forest Products. Rome: Food and Agriculture Organization of the United Nations.

[2] FAO, 1948. Forest Resource of the World. Washington: Food and Agricultural Organization of the United Nations.

*FORESTRY*

- Afforestation due to tax incentives or subsidization. But the long lead time in forestry is not favorable to get political support.
- Social forestry, such as forests for the people, worked well in some countries. Local ownership is often effective.
- Increase of growth by faster growing species, endogenous species, use of high quality species for seeds.
- Increase of availability of the forest resource by governmental subsidization of infrastructure, by more or multi-species use, decreased wastage, improvement of training and management.
- Afforestation, although a strategic issue, is impossible at 20 percent interest rate. This concern about the forbiddingly high costs of afforestation was widespread.

*LAND-USE*

- Restrictions on who may process where and what
- Research about land-use and appropriate patterns of ownership
- Increase of planning, training of planners
- Absence of lack of infrastructure

*ECOLOGY*

- Destructions, disasters, irreversible damage (fertilizers degrade soil, acid rain, goats, fires, shifting cultivation)
- Natural reservoir (gene pool, wild life refugee)
- Protective functions (soil, climate, water)

*SOCIAL IMPLICATIONS OF FORESTRY*

- Protection of the soils, protection of watersheds
- Purification and preservation of ground water
- Social forestry, forests for the people, agroforestry and multiple use of forest (fruits, nuts, food, fodder, water, amenities, microclimate, fish ponds, grazing)

*WOOD PROCESSING INDUSTRY*

- Quicker percentage increase of demand in developing countries than in developed
- High transportation costs favor not sophisticated processing for local markets. Infrastructure poorly developed in many regions.
- New technique will be made available which may reduce economies of scale. Sawmilling does not reflect economies of scale
- Planned distribution of the wood raw material between the different industrial branches and users may be a benefit for the whole society. Ban of roundwood export
- Financing (subsidization, tax incentives, customers to pay, joint ventures between developing and developed countries)
- Lack of private capital is a reason for government to invest in the forest sector. The largeness of investments are one reason
- The technological development will bring about less use of wood per unit of product. Increasing wood raw material prices will involve thinner paper, more recycling. Some wood products will face an increasing competition from competing products (e.g., between some sorts of paper and telematic).

*KNOWLEDGE-FIELD (TECHNOLOGY, SCIENCE, MANAGEMENT)*

- More rational and effective use of the resource in harvesting, processing and upgrading. Better control to reduce losses and wastage
- Processing of more types of ligno-cellulose materials (bamboo, grass, bagasse)
- Multiple products approach: medicines, gene pool, fruits and nuts, water, etc.
- Improvements in management with respect to forestry, soil protection, planning, education, training
- Working towards sustained use: how to use fertilizers that they no longer degrade the soil, how to decrease specific consumption all over the world, management of the delicate tropical forests

*Figure 1.* List of issues raised during the workshop. Some of the issues in the list are often belonging closely together. Keywords, which are listed under the heading of "forestry" for example often also belong to "ecology" or "economy," etc. The concept of multiple use of forests has implications for all areas listed.

Forest plantations compete with virgin forests which are "mined", usually not replanted and hence a source of very cheap raw material. As a consequence, forest management regimes directed towards sustainable forests cannot compete in those areas. Depletion of virgin forests will change this and cause increases in prices of wood and other forest resources. As a result, usage of other input materials such as bamboo and grass may increase.

There are, however, other reasons for maintaining forests apart from the fact that they are the source of wood raw material. Awareness of the environmental and social aspects is especially high in areas where there is widespread destruction of forests. Hence, afforestation or reforestation is often done although it is economically unprofitable. State subsidizations are widespread, and other financing schemes (specific purpose taxes) were also mentioned at the workshop. State control of land use, legal protection of forests and other preserving approaches were also discussed.

Profitability and financial resources are crucial issues which affect the long-term supply of forest industry products. Increasing economies of scale have required even more expensive investments in the forest industry, especially for the pulp and paper industry. At the same time, investments are necessary in the infrastructure (roads, harbors, etc). Transportation cost can be surprisingly high, necessitating direct government financial help. The other side of the coin is that high transportation costs can help keep local processing viable. One promise for the future is the present technological development towards reduced economies of scale and appropriate technology for local conditions.

## 3. TRADE PATTERNS

UNSO statistics for 1971 to 1979 show that developing regions as a whole appear to be net exporters of sawnwood (mostly from Asia and Latin America) but net importers of pulp (despite Latin America's increased exports) and newsprint. For some individual developing countries, this pattern seems likely to change over the next two or three decades. Discussion at the working meeting indicated that for Indonesia for example, there is a trend away from exporting sawnwood, as more of their production goes to the domestic market. They therefore expect to cease exports of sawnwood after 1985. On the other hand, for secondary wood products, there is a trend towards moving the industry to the raw material, rather than vice-versa: so that in future, there may be more trade of processed goods, rather than raw material. Indonesia is encouraging mills in Taiwan and South Korea to relocate, in order for them to enter the US plywood market.

For other countries, there are still plans to export more raw material, and the point was raised whether there will be an excess of countries wishing to export and problems of doing this due to lack of demand and/or trade barriers, e.g., Japanese trade barriers on hardwood, or substitution of wood products. For the Philippines, it seems that another reason why their plans to export sawnwood may not be achieved, is if their reforestation program is not effective. This point may also

apply to other developing countries. Nevertheless, Brazil plans to double its exports of sawnwood; Malaysia is also increasing its exports, but is finding new markets in the Middle East and China, apart from its current ones in the EEC and Japan. At the same time it is restricting its forest industry towards more secondary processing of wood.

It was noted that in the case of pulp and paper, Brazil is planning to increase its exports, which confirms the trend seen in UNSO statistics that developing regions are moving away from being net importers.

On the whole, the availability of export markets, and the imposition of trade barriers or tariffs seems to be two major factors affecting future world trade as well as the possibilities for developing countries to control reforestation and obtain financing for their forestry and forest industries. In Appendix 3, a global trade model for forest industry products is presented briefly. The model was demonstrated to the participants of the conference on a microcomputer.

## 4. PROSPECTS

The prospects of forestry and the wood sector and associated industries are difficult to judge. On the one hand, the future looks bleak: ever increasing pressures on the forests are resulting in widespread overexploitation, and because of high costs there is often no replantation. On the other hand, there do exist policies (see Table 1) capable of managing these problems. Feasible and favorable policies may vary from country to country.

One group of policies deals with the depletion of forest resources. Frozen consumption of wood or introduction of wood substitutes decrease demand. Supply of wood will be affected by actions such as land use control, increased reforestation, introduction of fast growing species, intensified forest management, changed land owner structure and prohibition of log exports. Some of these policies will have an immediate effect, for example, prohibition of log exports, while results of other policies are slow.

Policies for stimulating the industrialization are related to financial resources or cost of capital, and profitability of the investment. Joint ventures can help with the establishment of industry and marketing of products. Control of the distribution of wood processing could help the society to achieve regional and employment goals.

The quality of manpower can be improved through intensified training and education. Control of environmental pollution is still another policy.

More research, learning, and training is needed. It is necessary to move away from the traditional type of forestry as taught in the standard textbooks, which as developed for far less sensitive forests. Tropical forests are more delicate, and more complex than European forests; hence, more difficult to manage, but on the other hand they are far more capable of delivering a multitude of high-quality products. It seems that the complexity can best be managed within a local framework, i.e., within and together with the local community. If this is true, the industry and

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|---|
| — Decrease specific and total consumption of wood |
| — Promotion of wood substitutes |
| — Land use control, rationalization of land use |
| — Increased reforestation and afforestation |
| — Introduction of fast growing species, high quality species |
| — Intensified forest management |
| — Change in landowner structure |
| — Control of log exports (prohibit) |
| — Recycling, resource conservation |
| — Promotion of domestic investments (make financial resources available, low interest rates) |
| — Joint ventures between developed and developing countries |
| — Control of the distribution of wood between pulp and other industries |
| — Increased training, education and research |
| — Control of environmental pollution |
| — Legal protection of forests |
| — Increase people's participation, local ownership, forests for the people, social forestry |
| — Increase appeal of forestry by agroforestry, multiple use, multiple products |
| — Improve efficiency of use of firewood, substitute firewood |
| — Increase efficiency of use in the economy, reduce wastage, reduce losses, improve transport |

*Table 1.* Policies suggested for overcoming problems of the forest sector.

the transport system has to be adopted to this type of forestry.

Banning exports of unprocessed goods and promotion of joint ventures (if the partners in the developed countries are capable of understanding the different nature of tropical forestry) are the possible first steps towards independent forest industries in the developing countries. The present development of cheap micro-computers results in cheap sophisticated process-control systems which make local small-scale units more feasible, competitive and hence profitable. Parallel with the development of microcomputers with its demand for highly qualified people, training, learning, and research are becoming ever more important.

## 5. SYNTHESIS

The general concern expressed during the conference with the sustainability of the resource addressed a very basic and enduring problem. As financing of afforestation and reforestation is difficult, and as deforestation in most developing countries by far outpaces reforestation, it is obvious that the other values of forestry and the forest sector play a crucial role in the preservation of forests. Soil protection, societal issues, multiple use, issues of pollution, and supply of wood raw material for domestic industry are amongst those on the list of values from forests.

Of particular importance is training, learning, and the quality and availability of manpower to establish, protect and carefully and knowledgeably exploit the resources using it best in the industry. Both problems and prospects are often closely interconnected. This often makes it fairly difficult just to address present problems. Global issues, such as global trade, exchange of know-how, and global ecological influences, often make it impossible to look at only one country in isolation. Some attempts to adopt a global perspective can be based on global models, such as the trade model, presented in Appendix 2. Other attempts are to look at the effects of interrelationships as it is done within IIASA's Forest Sector Project by developing inter-linked models dealing with all seven areas depicted in Figure 1.

## APPENDIX 1: AGENDA AND LIST OF PARTICIPANTS

**Working Meeting**

FORESTRY AND WOOD PRODUCTS
PROBLEMS AND PROSPECTS RELATING TO DEVELOPING COUNTRIES

*International Institute for Applied Systems Analysis (IIASA)*

and

*United Nations Industrial Development Organization (UNIDO)*

27 January 1983, Laxenburg, Austria

*A G E N D A*

| | |
|---|---|
| 9:00 | Welcome<br>(C.S. Holling) |
| 9:15 | IIASA's Forest Sector Project: Structural Change in the Forest Sector<br>(Introduction by Markku Kallio) |
| 9:45 | *SESSION 1*: Problems and Prospects of Developing Countries<br>(Moderator: Lars Lönnstedt)<br>Topics for discussion:<br>— problems to address<br>— scenario assumptions (for example, technological change)<br>— policies |
| 10:30 | *Coffee break* |
| 10:45 | *SESSION 2*: Prospects for forestry and wood processing industries in various countries<br>(Introduction by Lars Lönnstedt and Jack Weeks)<br>Topics for discussion<br>— domestic demand<br>— investment costs<br>— processing costs<br>— wood availability |
| 12:15 | *Lunch* |

13:45 *SESSION 3*: Environmental effects
(Introduction by Wolf-Dieter Grossmann)

Topics for discussion

- effects on the social environment
- effects on the physical and biological environment

15:00 *Coffee break*

15:15 *SESSION 4*: Prospects for global trade in timber and wood products
(Introduction by Ann Francescon, Markku Kallio, and Sandra Buckingham)

Topics for discussion

- trade data
- supply
- demand
- trade policies

16:45 *SESSION 5*: Synthesis (Wolf Grossmann)

17:00 **Close (Markku Kallio)**

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APPENDIX 2

## GLOBAL TRADE MODEL OF FOREST INDUSTRY PRODUCTS

This model was developed during a 3-day workshop sponsored jointly by IIASA's Forest Sector Project and the Adaptive Resources Policies Project. Its development was an attempt to translate, during the course of the workshop, the policy concerns and process understanding of the participating scientists into an initial, working computer model of long-term changes in international trade of forest products. It should be emphasized that this is a first version of such a model; it was built from start to finish in a few days, using data at hand and the ideas of the workshop participants. The process of building the mode was intended to be a first step toward looking at long-term patterns in trade of forest products. Ideally, if the general approach of the model looks promising, the model could be revised and expanded through subsequent research activities and more focused mini-workshops until it represents a credible instrument for scenario development and policy analysis. The model simulates changes in world forest production and trade patterns over a thirty year time horizon, while updating on a two-year time step some basic variables such as forest inventories, demand parameters as functions of population and GNP, industrial capacity and allocation of raw materials to product groups (mechanical versus chemical processing), regional market prices, and export/import product flow patterns. It is intended to function as a scenario development/gaming model on Apple II microcomputers, and is written in Applesoft Basic. Compiled versions can execute a 30 year scenario in about five minutes. Graphic displays of production, exports, imports, an prices are produced during each scenario,

so users can watch the production unfold and make decisions to interactively change some key policy variables. These interactive changes are permitted at the start of each two year step, so quite complex scenarios can be developed.

In the current version of the model, nine parameters can be changed by the user to create different scenarios; they are the parameters which describe timber supply, demand, development of capital for wood processing, rigidity of trade flows, tariffs, and transportation costs These parameters can be changed individually for any of the trading regions.

The trade model itself is made up of for submodels — one simulates forest production and supply, one describes demands for different forest products, one determines short run prices, sales, and trade flow shifts, and the last simulates rates of capital investment.

Only two classes of forest products are considered in this version of the model; they are referred to as "mechanical" wood products, which include roundwood, sawnwood and panels, and "chemical" wood products, which are mainly the various types of pulp (secondary products like paper are not included). The eight countries or trading regions included in the model are:

1. U.S.A.
2. Canada
3. Europe (Western and Eastern)
4. Northern Europe
5. U.S.S.R.
6. Japan
7. Latin America
8. Asia

This regional breakdown was chosen in order to be able to describe with the model the major trade flows as they currently exist. There is no theoretical reason why more products or more regions cannot be included in this model. The number was restricted for this first version so that the model would not be too slow.