OCCASION

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

DISCLAIMER

FAIR USE POLICY

CONTACT

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

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

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

Background Off: Ms di Pietro, IPCT/Consult/41

18011

REVIEW OF WOOD AND WOOD PRODUCTS INDUSTRY IN BRAZIL

Mr. Reinaldo Herrero PONCE (CUT 89/527)

1. INTRODUCTION

The wood industry in Brazil can be considered as a pioneer type of industry. It started operating in the agricultural frontier producing materials for the settlers that arrived to occupy new regions in the interior of the country. The industries that were established in those regions used as raw material the logs bought from the clearing of the land by the settlers. The income earned by them was used for buying the necessary equipment to start their plantations. At the same time, jobs were criated which helped the immigrants that chose to live in the small cities. In the last few years the wood based industry, mainly the sawmills, are being criticized by environmentalists as being responsble for the devastation of the Amazon forest, the largest area of rain forest of the world. The objective of this paper is to give some insights for a better understanding of the present situation of the wood based industry and its future perspectives, through the presentation of facts related to their role in the utilization of the forests.

2. FOREST RESOURCES

2.1. Natural Forests

Brazil is geographically located between the parallels 5° North and 33° South, most of its territory being within the tropics. As a result, large extensions of forests are considered as tropical.

2.1.1. Amazon forest

The most important area of forest in Brazil is located in the northern region. It is called the Amazon which covers approximatelly 500 million hectares or 35% of the country's surface. The Amazon forest represents 20% of the world's tropical forests, and about 80% of the country's forest resources.

The Amazon forest is divided in two large groups: the lowlands or "varzeas" and the up lands or "terra firme". The forests located in the lowlands are subjected to seasonal flooding. The most important species found in those forests is the "Virola" (Virola sp).
Due to the easy access to this type of forest, it has been exploited more intensively in the last four or five decades. Other important species found in the "varzea" forest are: "Ceiba" (Ceiba pentandra), "Hura" (Hura crepitans), Crabwood (Carapa guianensis) and Muiratinga (Maquira sclerophylla). The "terra-firme" forests are not subjected to seasonal flooding and their composition varies according to the region.

Some are rich in Mahogany (Swietenia macrophylla), mainly in a strip in the south of the Amazon river. Other important species of the up lands are: "Freijo" (Cordia goeldiana), "Jatoba" (Hymenaea spp), "Ipe" (Tabebuia spp), "Tatajuba" (Bagassa guianensis), "Piquia" (Caryocar villosum), etc.

The number of tree species that occur in the Amazon forest is not known precisely. Some scientists estimate this number as being more than two thousand. The Amazon forest is extremelly heterogeneous occuring in some cases more than one hundred different tree species per hectare. This characteristic creates problems for the industry, because the market is generally restricted to only a few highly priced species. As a result, large areas are needed in order to get the required volume, thus, increasing the harvesting cost per unit volume.

During the last two decades, the construction of several roads in the Amazon region led to the start of the exploitation of the "terra firme" forest. Up to that period, the exploitation of this type of forest was less intensive due to problems of accessibility. With the opening of the roads immigration to the Amazon region increased and, as a consequence, the cutting of the "terra firme" forest was intensified, as clearing the land for cattle razing became a common practice. The deforestation in the Amazon forest, as estimated by using satellite imagery, has reached about 5% of its total area, according to the last studies conducted by the National Institute of Space Research - INPE.

2.1.2. Atlantic Forest

The other forest type of importance in the country is the Atlantic forest. Originally it occupied a large area of variable width on the Atlantic coast, varying from 6°S to 30°S latitude. Due to its location, this forest was the first one exploited by the early settlers. Most of this forest has been cut to give other uses for the land, such as agriculture, grazing, roads and dam construction, and other minor uses. The original area of this forest was estimated in 38,4 million ha; today the remaining area does not exceed 3 million hectares. This forest is very rich in highly priced hardwood species like Rosewood (Dalbergia nigra), "Pau-Brasil" (Caesalpinia echinata), "Vinhatico" (Platymenia reticulata), "Caviuna" (Machaerium scleroxylon), and many others. The remaining of this forest is located in the mountains and its exploitation has been banned by the Government.

2.1.3. Mixed Forest

This type of forest occurs in the southern region of the country, in altitudes varying between 600 and 1,200 meters, with deep soils and well distributed rainfall during the year. composed basically of "Parana pine" (Araucaria angustifolia), "Imbuia" (Phoebe porosa), and a large numbers of other broadleaved, including the "Erva-Mate" (Ilex paraguariensis). This last species is used to make "chimarrão", a type of tea normally drank by the "gauchos" in Brazil, Uruguai, Paraguay and Argentina. The "Parana pine" is the most important species of this forest, and has been intensivelly expolited since the beginning of the century. It is estimated that 1983 existed approximatelly 500,000

hectares of "Parana pine" forests according to the Nacional Forest Inventory, IBDF, 1983.

2.1.4. Open Broadleaved Forest

The savanna or "cerrado" as it is normally known, corresponds to an area of approximatelly 200 million hectares, located basically in the center and in the center-west regions of the country. It comprises a series of formations which vary from scrub and grassland to relatively dense forests (trees up to 20 meters high) mainly in the banks of the rivers. The wooded savanna, also called "cerradão" is composed, depending on the region, of very dense hardwoods such as "Aroeira" (Astronium urundeuva) one of the most durable tree species found in Brazil, and used for posts, poles and construction, and other hardwoods mostly used in the production of charcoal. This woodland has been threatened since the last decade, because it was found that in some areas, the soil and climate are adequate for soybean crops. In these and other areas where the topography is favorable, the trees were cut for such plantations.

2.2. Plantations

The first record of reforestation in Brazil is of 1861 when about 100,000 trees were planted in an area known as "Morro da Tijuca" in Rio de Janeiro. Indigenous species were used in that reforestation and today it looks like a native forest.

Plantations for economic reasons were installed in the beginning of this century, when the Cia. Paulista de Estrada de Ferro, through the efforts of Navarro de Andrade, introduced the genus Eucalyptus from Australia. The main objectives of this project were to produce wood to be used as a source of energy for the locomotives and to produce cross ties. From that time, during decades, that company established several forests bordering its railways.
Exotic conifers were introduced during the 40's because of the beginning of shortage of "Paraná Pine". Companies that used this species as raw material, mainly for pulp, were concerned about the future supply.

The "Instituto Florestal do Estado de São Paulo" played an important role in the introduction of exotic Pines in Brazil by carrying out investigations and plantations in many state forests throughout the state of São Paulo.

Before 1966 only companies that used wood as a source of energy and raw material established their own plantations, mainly of Eucalyptus. Some pine species were also planted to supply their needs of wood. In that year the federal government passed a fiscal incentive's law for reforestation. This was the cornerstone in the forest plantations in the country. The availability of capital allowed for the rapid growth of areas planted with forests. Several companies started do specialize in collecting the capital incentives, and to execute the plantations. Table I shows areas of reforestation projects approved and established from 1967 to 1986. From this table it can be seen that the genus

TABLE I

Reforestation with fiscal incentives in Brazil
(1000 ha)

YEAR	PINUS	EUCALIPTUS	OTHER	TOTAL
1967	18	14	3	35
1968	61	30	12	103
1969	96	54	12	162
1970	120	84	18	222
1971	99	129	21	249
1972	101	172	31	304
1973	86	161	47	294
1974	83	188	53	324
1975	94	223	81	398
1976	87	262	100	449
1977	99	194	53	346
1978	141	228	43	412
1979	118	283	73	474
1980	89	272	75	436
1981	117	230	71	418
1982	158	187	86	431
1983	74	91	50	215
1984	71	124	91	286
1985	65	131	89	285
1986	85	174	150	409
T O T A L	1862	3231	1159	6252

Source: IBDF, 1988. Estatisticas de Reflorestamento. Brasília.

Eucalyptus is the most planted species with an area of 3,231,000 ha, while the second most planted species is from the genus Pinus with 1,982,000 ha; the Others group includes plantations of "Paraná Pine", Gmelina arborea, native hardwoods, and also fruit trees (mainly apples, pecan and cashew).

The Eucalyptus plantations have several uses such as production of charcoal, pulp, fiberboard, particleboard, firewood, poles, fence posts and, only a very small fraction, sawlogs. As a result of the uses given to the Eucalyptus plantations they are normally managed by coppice with clearcutting every five to seven years. The number of cuttings varies according to the species, soil and care in management, the minimum being three cuttings, but five or more cuttings are also common. The annual increment also varies. In 1969 the average increment was approximatelly 15 m^3 ha^{-1} $year^{-1}$ and in 1979 this figure increased to about 30 m^3 ha^{-1} $year^{-1}$. Presently companies which carried out investigations on silviculture and tree breeding, are getting annual increments as high as 70 m^3 ha^{-1} $year^{-1}$ and, in some experimental stands, even more than 100 m^3 ha^{-1} $year^{-1}$. Up to now, the utlization of Eucalyptus in sawmilling is not very expressive, being restricted to small sawmills producing for local markets.

Pine species where planted in Brazil had different origins depending on the region the plantations were established. In the southern region, species from temperate areas were planted, mostly Pinus taeda and Pinus elliottii from the southeast region of the USA.. From the middle north of the state of São Paulo up to the north of the country, tropical species such as Pinus caribaea, Pinus hondurensis, Pinus oocarpa and other less important were planted. The Pinus plantations are managed through thinnings, the first one carried out at seven or eight years, and a rotation between 20 to 30 years. The main uses of the pine plantations are for lumber, pulp, particleboard and peeling logs.

3. PROSPECTIVE SUPPLY OF ROUNDWOOD

The supply and demand of raw material for the wood industry in Brazil is very complex and cannot be treated simply through the estimation of possible cuttings and the consumption of the industry.

If one analyzes of the sawmill and plywood producers of the wood industry sector for example, it is possible to see that these industries have moved across the country. They started on the southern region exploiting mainly the native "Paraná Pine" forests and when these forests were depleted, they moved to the center-west region. When forests in this region were cleared, they moved to the north, towards the Amazon region. It is possible to say that in most areas where the forests were cleared, the main cause of such clearing was not the manufacturing of lumber or plywood, but the farmers and cattle grazers which changed the land use pattern. So, the main obstacle for the future of the wood industry in Brazil is not the timber harvesting, but

the clearing and burning of the forests for other reasons than wood production. The deforestation caused by land clearing is also responsible for the wave of international criticism against Brazil, with respect to the destruction of the largest tropical rain forest of the world. Timbermen are probably the most hurt by the situation, because they need to cope with an environment which, in a few years, change from a timber-rich region to a place cleared and depleted of raw material, in addition, they suffer the prejudice against their activity of timber processing.

The question of future supply needs to be analyzed at a level of sub-sector, almost mill by mill or even species by species. For example, because of the intensive harvesting of species such as "Paraná Pine" in the southern region, Mahogany, "Cerejeira" and "Freijó" in the Amazon, many sawmills and plywood plants are closing or being transferred or, at least, changing to other lesser-known species. The problem is that from the thousand of species of the Amazon forest, only a few have commercial value and if such species are depleted in an area, the mills have to be transferred to other places or have to change to other species.

In the southern Brazil, with the almost complete extinction of the native forest resources, with exception of a small fraction of Araucaria forests, there is no alternative besides plantations. Presently most part of the primary wood industry in the industrialized southeast and southern regions are based in raw material from plantations. The only exception is the decorative veneer industry that depends on logs produced in the Amazon region.

In the future plantations should play a more important role in supplying the wood industry as a whole, besides the particle board and fiberboard manufacturing, which is now almost exclusively based on plantations.

Table II shows the supply and the demand of round wood in 1987/88 according to a recent survey carried out by IPT and SBS (4).

4. WOOD PROCESSING INDUSTRY

4.1. Primary Processing

The most important of the mechanical wood processing industry, in terms of its number and volume of wood processed, is the sawmilling industry. The number of sawmills operating in Brazil is not known. According to a study carried out in 1987 by IBF/UFRRJ (3), 2,892 sawmills were operating in the Amazon region, producing around 14.7 million cubic meters of sawn timber of a diversity of species. In the south and southeast regions the sawmilling is based mainly on one species, the native "Parana pine", and in plantations of Pinus.

TABLE II

Supply and Demand of Roundwood in Brazil - 1987/88

(1000 m^3)

Item	Production	Roundwood Equivalent	%
A) DEMAND OF INDUSTRIAL WOOD			
Celulose (10^3t)	3.664	14.740	6
Charcoal	34.349	68.700	26
Sawnwood	16.790	33.500	13
Wood based panels		7.550	2
. Plywood	2.000	4.800	
. Fiberboard	750	1.490	
. Particleboard	700	1.260	
	Sub-total	124.490	47
B) FIREWOOD DEMAND		139.000	53
	TOTAL	263.490	100
C) WOOD AVAILABELE FROM PLANTATIONS			
Eucaliptus	64.300		
Pinus	18.000		
Sub-total		82.300	
D) SUPPLY FROM NATIVE FORESTS (diference)		181.190	

SOURCE: IPT/SBS

In spite of the area planted with Eucalyptus being larger than that of Pinus, the participation of the former in the supply of saw logs is comparatively much smaller than the later.

Table III shows the production and its future projections of the sawmilling sector in the southern region. It can be noticed the decreasing participation of the native species in the production and the increasing participation of the plantations, represented basically by the pine species.

The majority of the sawmills in Brazil can be considered as very small. In a survey in the sawmilling industry carried out in the Amazon region (3, 4), 71.8% of the sawmills produced less than 5,000 m^3 per year; 22.6% produced between 5,001 and 10,000 m^3 per year and only 5.6% produced more than 10,000 m^3 per year.

Most of the equipments in use by the sawmills in Brazil are manufactured in the country. Several companies produce sawmill equipments, most of them being located in the southern states. The typical set of equipments in the sawmills is composed of a band mill headrig with wheel diameter between 1,000 and 1,800 mm, a manually operated carriage of three or four headblocks, a circular edger manually fed and a pendulum cut-off saw. Mechanization is found only in a few larger mills. In most of the mills, the logs enter in the headrig without being debarked. In sawmills operating with native species, circular headrig is almost nonexistent. In areas with Pinus plantations the typical sawmill has the following equipments: one scragg-mill, one multiple circular saw, one resaw and a trimmer. A variation is the twin band saw headrig used in some mills. In sawmills operating with pine, debarking is not common.

A characteristic of the majority of the sawmills operating in Brazil is their low technical level and, with few exceptions, lack of trained operators. Consequently, the production, the recovery and the quality of their products are also low. One characteristic of the lumber produced by many of those mills is the large proportion of misscut pieces.

The estimated production of 250 plywood industries surveyed in 1988 was of 2.0 million cubic meters. About half of those plants were located in the Amazon region, and the other half in the southern region. A small number was located in other regions. The plants located in the southern region utilized mainly "Parana pine", Pinus, broadleaved species of the mixed forests, and also imported veneer produced in the Amazon region.

The plywood industry of the Amazon region is divided in two main groups: the first is located in the banks of the Amazon river or its tributaries and is supplied with logs from the flooded-plains ("Varzeas"), where the main species are "Virola", "Assacu", "Sumauma" and "Muiratinga". The second is composed of plants located near the roads, in the areas of agricultural frontier, and use species like: "Copaiba", "Goiabão", "Morototó" and others of the "terra-firme". The first group depends on the flooding of the rivers to transport the logs

TABLE III
Production and Projections of the Sawmilling Setor in the Southern Region

(1000 m^3)

YEAR	PARANA PINE	HARDWOODS	PINUS	TOTAL
1975	3060	1879	-	4939
1976	3039	2155	-	5194
1977	2843	2541	-	5384
1978	2778	1858	17	4663
1979	2267	2214	54	4535
1980	1986	2364	130	4480
1981	1430	1874	202	3506
1982*	1145	1510	336	2991
1983*	740	905	385	2030
1984*	740	905	520	2165
1985*	480	540	700	1720
1986*	420	335	945	1700
1987*	480	340	1275	2095
1988**	550	370	1600	2520
1989**	480	340	2000	2820
1990**	380	270	2500	3150
1991**	300	210	3125	3635
1992**	240	180	3900	4320

* Unofficial estimates, because of the lack of official data
** Projections

SOURCE: Associação Brasileira de Produtores de Madeiras. 1988.

and the second, depends on the dry season for harvesting and transportation of the logs.

In spite of the fact that only 3% of the area of the Amazon forest is "Varzea", its contribution to the industry is important because the

"Varzea" is not suitable for agriculture or pasture. As a result, there is no change in the use of the land, and the future supply of wood is not under risk (2). The "terra-firme" forests on the other hand, are more suceptible to changes in the use of the land, and the sawmills may have to be transfered in the future due to the scarcity of wood.
In more than 95% of the planats, the equipments utilized are manufactured in the country.

Fiberboards are produced by two large companies in three plants. The production amounts to 750,000 cubic meters per year. Most of the production is harboard and some softboaro. The raw material is Eucalyptus from plantations. The technology of fiberboard production is imported but the participation of brazilian made equipments has been growing in the last years. Because of the uniformity in the raw material, high quality products are being manufactured. About 30% of the prodution is being exported.

There are about 12 particleboard plants in Brazil, with a production of approximately 700,000 cubic meters per year. The raw material comes mainly from plantations of Pinus and Eucalyptus.

4.2. Secondary Processing Industries

4.2.1. Wood on construction

In Brazil, like in other Latin American countries, there exists a disseminated prejudice against wooden houses. Wooden houses are used with relative frequency in some areas of the southern region where predominates immigrants from central Europe or their descendents, and in the agricultural frontiers of forested regions. Wooden houses are generally considered as second class houses. The use of bricks or cement blocks prevails in the construction of houses in most of the areas of the country. In the poor areas it is commom to make houses of "taipa", a mixture of mud over a net of wooden sticks.

The most common type of wooden houses in Brazil are those made out of walls with vertical boards and battens. The walls have a structural fuction which have also some kind of studlike pieces on the corners and around doors and windows, with extensions up to the ceiling and the floor. The floor is made out of stripes nailed over timber beams, the nailed roof structure is made of wooden beams and rips. The roof is made out of clay tiles, and the ceiling of tongue and grooved panel. Windows and doors are of solid wood.

The species used depend on the availability. In the south was common to use "Parana pine". In other regions, hardwoods are used for most of the wooden houses. The use of plywood or other types of panels are not common.

Prefabricated wooden houses are not common in the country. Some companies started to produce them about 30 years ago, but they did not succeed for several reasons such as: barriers for long term financing, legal obstacles to construct them in some areas of the cities, the prejudice against wooden houses and the low quality of some of the houses. Presently, most of the prefabricated houses are destinated for vacation houses on beaches or cottages.

Bricks or concrete blocks houses, usually have the roof structure made out of wooden beams and rips, and covered with ceramic tiles. The doors are generally of solid wood or of flush type. The windows are made out of wood, steel or aluminum.

Other uses of wood in construction are in scaffolding, concrete forms and support collumns during building.

There are no statistics about the volume of wood used annually in the construction field.

4.2.2. Wood in Packaging

This sector has been experiencing a fast growth in the last few years. The trend is the increasing of the production of pallets and crates. It is observed a reduction of the production of wooden boxes because of the competition of corrugated board and plastics. The production is been tasnferred from the southern region of the country to the Amazon region. In the south and southeast regions the change is from native species to wood from plantation.

According to ABPM (1), the use of the several types of wooden products in the pakaging industry is as follows:

Sawnwood	76,8%
Veneer	8,8%
Plywood	12,7%
Blockboard	0,6%
Fiberboard	1,0%
Other	1,1%

With respect to the species of wood utilized, the figures are shown below:

Paraná Pine	17,6%
Pinus spp	42,2%
Canelas	18,2%
Peroba	3,9%
Other	18,1%

According to a survey done by ABPM the main problems that affect the

packaging sector, are as follows:

	Frequency
1. Problems of standard of quality, such as misscut lumber, green wood, etc	23,5%
2. Irregular supply of primary wood products, mainly delay in delivery and not honored orders	17,6%
3. High costs and lack of regularity in the transport of wood inputs	17,6%
4. Instability of the buyer market	11,7%
5. Lack of reliable suppliers of inputs	6,0%
6. Lack of raw material (forest resources) in the southern region of the country	5,9%
7. Variation in the prices of inputs, impairing a reasonable pricing of the products	5,9%
8. High financial costs, resulting in high working capital costs	5,9%
9. Inflation and high interest rates	5,9%

4.2.3. Wood in Furniture

The furniture industry with more than 13,000 enterprises employing more than 200,000 people, is about 3% of the industrial labor force of the country. According to there capital, 70% are considered as micro-enterprises, 26% are considered as small enterprises and about 4% are median to large companies. More than 90% of the companies are located in the states of the south and southeast regions, the remaining are spread in the other regions. As far as the wages and salaries paid to the employees, the furniture industries are among the lowest of the industrial sector. The capital of furniture producers is predominantly national. The equipment used is mainly brazilian made. It may be considered as adequate to produce furniture for the domestic market and even most part of the export market, because some of the equipment manufacturers are, in the last few years, producing quite up to date equipment, mainly to process particle board furniture.

According to ABPM (1) the furniture industry in Brazil, has the folowing distribution of input materials in terms of volume:

Sawnwood	50,8%
Veneer	10,2%
Plywood	6,7%
Blockboard	3,3%
Particleboard	18,6%
Fiberboard	7,4%

Other	3,0%

According to ABPM (1), the most used wooden species for the manufacturing of furniture are:

Pinus spp	34,5%
Canela	11,2%
Cerejeira	10,5%
Imbuia	9,8%
Mahogany	4,9%
Parana Pine	4,4%
Virola	2,8%
Cambará	2,1%
Cedro (Cedrela)	1,6%
Peroba	0,9%
Jatrbá	0,7%
Other	16,6%

Today the furniture industry is working at 75% of its capacity. Acccording to a survey done in 1988 by the ABPM, the main problems of the furniture industry are the following:

	Frequency
1. High transportaion costs, basically truck, besides lack of availability of trucks because of the competition with agricultural crops	24,5%
2. Low standard of quality, both in the pine wood from the south and in the hardwood from the Amazon, high standards are exported as sawnwood	22,5%
3. Inflation and high interest rates, causing high working capital costs	15,2%
4. Lack of reliable suppliers, orders not honored, irregularities in the deliveries, both in therms of time and quality of products	12,0%
5. Progressive scarcity of wood in the southern region, as well as the large distances from the suppliers from the Amazon	7,6%
6. Instability in sellings and difficulties in receiving the debts of buyers	
7. Lack of definition of the government policy in relation to the econimic program	3,6%
8. Other	14,6%

The annual exports presently with a value of US$. 45 million are about 5% of the production. This value corresponds to less than 0,5% of the world's furniture trade.

5. MARKET, TRADE AND TECHNOLOGY

One of the characteristics of the wood based industry in the country is the lack of reliable informations. This situation is so serious that afected the writting of this report. Presently no informations are available, for example, about the total volume of wood used in the several secondary wood processing sectors. Informations about the situation of a sector exists only if government institutions collect them in a specific survey, but this is unusual. The wood based industry lacks a system of information that could be used for marketing, planning or other functions.

Another fundamental instrument in the development of the wood based industry is the trade or professional associations. But untill now, these associations are not being very effective in helping there associates. For example, presently there is a well managed propaganda campaign in which are blamed, among others, the wood industry for the environmental deterioration of some areas of the country. Untill now, none of the associations are active in the defense of the sector which are not more neither less responsibe for the environmental situation.

Lack of an effective marketing is one of the causes of the poor performance of the sector in the international trade. For example, the participation of brazilian products is almost insignificant in the world's market of furniture, sawnwood, plywood, mouldings, wooden parts for housing, etc.

Education is another weak point affecting the sector. With very few exceptions the vocational schools prepare workers more for carpentry or artisanship than for the operation of machines, tool maintenance or wood drying. At the median level, there are practically no schools to prepare students on wood working. Exceptions are the technical forest schools with courses in basics of wood technology. In the professional level wood technology, wood processing, wood as a structural material are subjects included in the programs of schools of forestry and civil engineering but, there are generally few classes covering only generalities. In the area of design, the schools are more related to the area of arts than to industrial design. Exceptions are very few.

Research and development are also demanding efforts but, because of the economic problems, investments in these areas are low. Traditional wood species are completely exhausted and the industry seems to be waiting for the situation to get worst before taking any action to effectively study the subject in order to introduce other species. Presently, most of the furniture industries located in the southern states, are paying high costs for the transportation of wooden material from the Amazon, a distance of more than 3,000 Km from the factories. Very little effort is being done to investigate the introduction of new species, to make plantations, tree breeding or whatever means would be necessary in order to keep the suplly of indigenous or even exotic species adequate for the needs of the industries.

6. CONCLUSIONS

After an overview of the wood industry in the country, the following conclusions can be drawn:

1. The supply of raw material is not threatened but, as related to the quality, some areas of the industry are already under serious troubles.

2. The native forests of the south and southeast regions of the country, where most of the secondary wood industry and of the demand for wood are locate, are almost completely depleted.

3. The cost and related problems of transportation of wood from the Amazon forest to the industrialized areas are, among other aspects, the main obstacles to the development of the industry.

4. Almost nothing is being done in terms of research & development both in the industrial and silvicultural areas.

5. There is a shortage of adequately trained personel in all levels in the industry, from production to managerial areas.

6. The supply of raw materials is interdependent with the environmental problems, the production of wood is the most ecological of the agricultural activities.

7. Information, a key instrument for decision making, is very scarce today in almost all levels.

8. The transport infrastructure is stagnated and surpassed, making transportation costly and uncertain.

9. The industry, because of difficulties in financing, is outdated in terms of equipment and process.

7. RECOMMENDATIONS

1. The wooden products industry has to solve the crucial problem of shortage of raw material, through a program of forest management and plantations.

2. The money spent in training, research and development is investment, not expenses, and generates dividends if reasonably managed.

3. Re-location is a possible alternative to the high costs of raw material.

4. Trade and professional associations need to understand that information is essencial in decision making and the costs involved

in collecting relevant informations are small as compared to the benefits obtained.

5. Wood industry is closely related with the conservation of the environment and it can not miss the opportunity to defend the idea that this industry is the most dependent on the conservation of the forests.

6. Technical education is fundamental in the development of the sector then it has to be required, asked, defended by the sector in all levels.

7. Scarcity of raw material is a progressive obstacle for the sector, efforts need to be done in order to increase the recovery of wood in all phases of the process.

8. Great efforts need to be done by the industries in order to improve working conditions such as in security, comfort, ergonomics, increase in mechanization, etc. this will result in increased productivity an lower costs.

9. Efforts need to be done in improving and increasing the standardization of products, parts, equipments, etc. in order to permit interchangeability and rationalization.

11. People in the sector, because deficiencies on formal or informal education, generally does not go into much details in process, raw material, quality and recovery, such details make the difference between the excelent and the poor product.

8. REFERENCES

(1) Associção Brasileira de Produtores de Madeira. Perfil de Consumo de Produtos de Madeira "Processamento Mecânico", ABPM, São Paulo, 19899.

(2) Bruce, R.W. Log supply in Amazonas state, Brazil availability and constraints to utilization. Paper presented at the International Round Table on Opportunities and Limitations for the Latin American Tropical Hardwood Industry, sponsored by ITTO, Brasilia, Feb. 20-23, pg. 185 - 204.

(3) Reis. M.S. 1989 Tropical hardwood industry in Brazil: present situation and future perspectives (A industria de madeiras tropicais no Brasil: situação presente e perspectivas futuras). Original in portuguese. Paper presented at the International Round Table on Opportunities and Limitations for the Latin American Tropical Hardwood Industry, sponsored by ITTO, Brasilia, Feb. 20-23, typescript 25 pp.

(4) Sociedade Brasileira de Silvicultura (1989) A sociedade brasileira e seu patrimônio florestal, SBS, 20 p.