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THE CANADIAN FORESTRY SECTOR: AN INDUSTRIAL AND TECHNOLOGICAL PROFILE

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INTRODUCTION

Canada has a total land area of 997 million hectares, nearly half of which is covered by forest. Canadian forests represent 10% of the world's forested area. Some 244 million hectares of forested area in Canada can be used for logging and can produce commercially exploitable stands. Eleven percent of this productive forest land is owned by the federal government, approximately 80% by the provinces and the rest by private owners, namely individuals and corporations.

The sheer magnitude of Canadian forest lands explains the large-scale commercial forest harvesting in this country. The forest industry has been a powerful driving force in the Canadian economy for several decades. The growth of the forestry industry has stimulated the development of other manufacturing and service industries. On the one hand, its products supply many other sectors of the economy, such as residential construction, furniture-making, printing and publishing. On the other hand, the forestry industry is also a major consumer of energy, chemicals, transportation services, machinery and processing and control systems.

However, Canada's forest industry is currently in a difficult situation. The recession and an unfavourable exchange rate are threatening the financial viability of many businesses. This situation limits the options in terms of investment in capital and equipment projects, modernization of mills and state-of-the-art technology, and the industry is being forced to restructure quickly.

In addition to the cyclical problems encountered by the industry, the long-term viability of Canada's forest sector is also threatened by two other factors: economical supplies of quality wood are becoming increasingly scarce because forestry management is still inadequate; and the Canadian forestry industry is in danger of being overtaken on the international market by competitors who have been able to take advantage of new technology.

While foreign mills are producing high value-added products, many Canadian companies are still dependent on primary product markets with their shrinking profit margins. Canada finds itself in a disastrous situation vis-à-vis its main competitors, because its businesses have not taken advantage of technological opportunities to increase their efficiency and diversify their production.

This paper provides a general overview of the Canadian forest industry, describing its structure, output and current difficulties. It also presents a technological profile of the industry and its prospects, particularly with respect to research and development (R&D). It identifies the major sector players, lists the funding they receive and highlights the industry's technological shortcomings, which may to some extent explain the current problems.

STRUCTURE AND OUTPUT OF THE INDUSTRY

A. Structure

The Canadian forest industry encompasses a wide range of activities, from timber harvesting to the manufacture of a variety of wood and paper products. As shown in Table 1, it comprises four main sectors: forestry services, logging, wood industries, and paper and allied industries. Over the years, the forest industry has diversified its products and services to achieve the wide range shown in Table 1. Some sectors of the forest industry are particularly well integrated. For example, most paper and all newsprint is currently produced in mills that both make the pulp and process it into paper products; a number of paper mills also own their own sawmills. However, there is less integration in the wood products sector, where small secondary conversion companies frequently purchase wood from large primary conversion plants.

Forestry activities are concentrated in three provinces: British Columbia, Quebec and Ontario. As Table 2 shows, these three provinces specialize in different forest products. British Columbia accounts for 51% of logging and for 45% of the wood industry activity. The pulp and paper industry is more active in Quebec and Ontario, which together account for 62% of activity in this sector.(1) In addition, forestry is a vital component of many regional economies. Nearly 350 Canadian communities rely on logging and wood processing for their main source of income.

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(1) Statistics Canada, *Canadian Forestry Statistics*, 1988.

TABLE 1
STRUCTURE OF CANADA'S FOREST SECTOR

INDUSTRY CLASSIFICATION	COMMODITY CLASSIFICATION
Forestry Services Reforestation services Forest protection services Forestry nursery services	
Logging Firms harvesting logs and pulpwood Firms delivering logs and pulpwood to mills	**Primary Wood Products** Logs and Bolts Pulpwood Poles, pilings, fence posts Fuelwood Wood chips
Wood Industries Sawmills and planing mills Shingle and shake mills Veneer and plywood mills Sash, door and other millwork Wooden boxes and pallets Coffins and caskets Other wood industries	**Wood-Fabricated Materials** Lumber Shingles and shakes Veneer Plywood Particleboard Waferboard Other: Sash, door Kitchen cabinet Bathroom vanity Box, pallet Coffins
Paper and Allied Industries Pulp mills Newsprint mills Paperboard mills Other paper mills Asphalt roofing Paper box and bag Other converted paper	**Wood Pulp and Paper Products** Wood pulp Newsprint Other paper and paperboard: Book and writing Fine tissue and sanitary wrapping Paperboard Converted paper Building paper and board

Source: Forestry Canada, *Forestry Facts*, May 1990, p. 21.

Some regions are dependent solely on the forest industry for their development so that rationalization of operations and mill restructuring have a major impact on the local economy. For example, the closure of the Canadian Pacific Forest Products (CPFP) plant in Trois-Rivières implies a loss of some 1,500 jobs, representing a total annual payroll of approximately $50 million. Because of the multiplier effect, the adverse economic impact of this mill closure on the region could be even greater.(2)

B. Production

Figure 1 shows the industry's contribution to the country's economic activity. The forest industry as a whole is a major contributor to the economic and social development of this country, representing on average 3.4% of the Canadian GDP between 1975 and 1991.(3) This figure was 3.1% in 1991, with wood industries accounting for 0.9%, paper and allied industries for 1.6%, and forestry services and logging for 0.6%. The proportion of GDP generated by the forestry sector in 1991, however, was the same as in 1982, the lowest level in several decades.

The newsprint sector has been particularly hard hit by the current recession, the second in less than ten years. The Canadian Pulp and Paper Association (CPPA) estimated total industry losses for 1991 at $1.5 billion, compared to the $265 million loss posted during the 1982 recession.(4) Some analysts believe that newsprint producers will not come out of this downturn for several months because of production over capacity across North America. According to their estimates, about 10% of newsprint machines will cease operation or be converted in 1992. They argue that the industry must eliminate some of its production capacity if the pulp and paper sector is to be turned around.(5) Some mill closures have already been announced: the Cascades pulp mill in Port-Cartier and its pulp division in Jonquière; the Donohue mill in Matane; the Abitibi-Price fine paper mill in Thunder Bay; the Fraser market pulp mill in Atholville; and the CPFP mill in Trois-Rivières.

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(2) "Le Fonds FTQ accepte d'aider les 1 500 employés du PFCP à Trois-Rivières à évaluer une possible relance de l'usine," *Le Soleil* (Quebec City), 11 January 1992, p. B-4.

(3) Statistics Canada, Cansim Division.

(4) Claude Turcotte, "Pas de profits en vue cette année pour les pâtes et papiers," *Le Devoir* (Montreal), 11 January 1992, p. A-6.

(5) "Pâtes et papiers: pas d'amélioration en vue avant 1993," *La Presse* (Montreal), 11 January 1992, p. C-2.

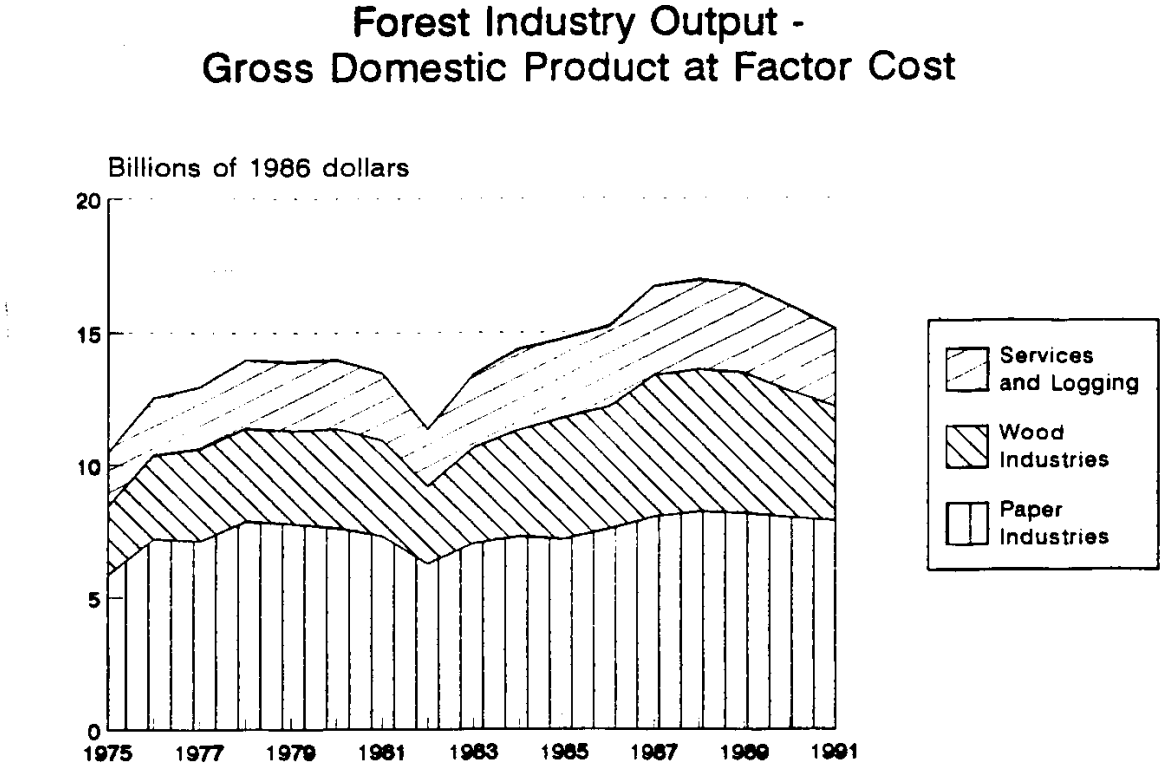
TABLE 2
REGIONAL BREAKDOWN OF THE FORESTRY INDUSTRY

	Atl.	Que.	Ont.	Prairies	B.C.	Canada
Number of Establishments						
Logging	1,476	2,735	1,727	606	4,036	10,580
Wood Industries	342	1,218	926	391	763	3,640
Paper and allied industries	45	218	330	60	65	718
Forestry-dependent communities	57*	126	41	21	103	348
Direct jobs (in thousands)	33	110	84	21	99	347

Source: Forestry Canada, *The State of Forestry in Canada, 1990 Report to Parliament*, p. 11-15.

*Excludes figures for Prince Edward Island.

Figure 1



Source: Statistics Canada, CANSIM Division and Library of Parliament.

Other companies have decided to reduce their production capacity. For example, CPFP decided to cease operation of two paper machines at its plant in Dalhousie, New Brunswick. Macmillan Bloedel, the largest forestry company in British Columbia, has not only trimmed its production capacity but has also announced that it is contemplating participating in the construction of a newsprint recycling plant in California, on the grounds that such an investment would be more cost-effective than importing old newspapers and recycling them in Canada. Fletcher Challenge Canada Ltd., the second-largest forestry company in British Columbia has decided to scale back its investments in Canada and transfer some of its operations to the United States, where production costs are lower.(6)

C. Employment

In 1991, the industry employed some 299,000 workers. Of this figure, 38% were in the wood products sector, 41% in the paper and allied industries sector, 16% in logging and 5% in forestry services.(7) Through its links with other economic sectors, the forest industry has also generated a large number of indirect jobs. If all direct and indirect jobs are taken into consideration, the forest industry is one of the main employers in Canada. It is estimated that in 1989 forestry created one out of every 14 jobs in Canada, or 7% of the labour force.(8)

As can be seen in Figure 2, employment in the Canadian forest industry has remained relatively stable over the past two decades. Business cycles are primarily responsible for employment fluctuations in the industry. For example, the recession of the early 1980s was responsible for a 15% drop in employment. After 1982, the return to previous job levels in the industry was attributable to economic growth and strong export markets. In particular, the number of jobs in the wood and paper industries increased significantly between 1985 and 1989. Between 1989 and 1990, however, the level of employment in the forestry industry dropped by nearly 9%. In addition, the recession led to several more thousand job losses in 1991. Forestry Canada estimates that approximately 20,000 jobs were lost; this is a drop of more than 6% from 1990. The lumber and pulp and paper sectors, where employment decreased by 9% and 7% respectively, were particularly hard-hit. The layoffs affect both small sawmills and large pulp and paper mills in every region of the country.

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(6) R. Haliechuk, “Axe to Fall in Forest Industry?” *Toronto Star*, 21 December 1991, p. C-1.

(7) According to estimates provided by Forestry Canada on 31 January 1992.

(8) Forestry Canada, *The State of Forestry in Canada, 1990 Report to Parliament*, Ottawa, April 1991, p. 9.

Traditionally, the forest industry has attempted to fight recessions by curtailing production and temporarily laying off workers. Industry losses in 1991 were so severe, however, that some analysts believe that a massive restructuring of the industry will be necessary. Some workers in the industry who lost their jobs will probably never get them back.

D. Exports

Canada is one of the leading exporters on international forest product markets. It is the largest producer of newsprint (31%) the second-largest paper pulp producer (16%) and ranks third in the production of softwood lumber (16%). Canada also exports more processed forest products than any other country. The United States, which buys 65% of our exports, is our largest customer, followed by the European Economic Community (15%) and Japan (11%).(9)

Forest industry exports in 1990 were worth $22 billion, or 16% of all Canadian exports. Since Canada imports very few forest products, the forest industry posts a very large trade surplus, higher than the combined trade balance for agriculture, fishing, mining and energy.

Figure 3 shows changes in forest product exports since 1975; their value is expressed in constant 1986 dollars. Nearly half of all the forest products made in Canada are exported. The main forest product exports are wood pulp, newsprint and softwood lumber. These three products accounted for more than 75% of the total value of exports in 1990. However, the value of exports has declined since 1988 because of factors such as the fall in newsprint prices stemming from the increase in North American production capacity, the decline in housing starts in the United States, the increase in the value of the Canadian dollar and the general downturn in the world economy.

INDUSTRY SITUATION

The preliminary data for 1991 show that the forestry industry as a whole has been hard-hit by the current recession. The pulp and paper sector is proving to be particularly vulnerable to the vagaries of the economy. The problems and closures in this important sector are also affecting logging and the wood industries, however, because of the integrated nature of the operations of some companies. Some estimate that when a paper mill shuts down, four or five sawmills could face a similar fate.

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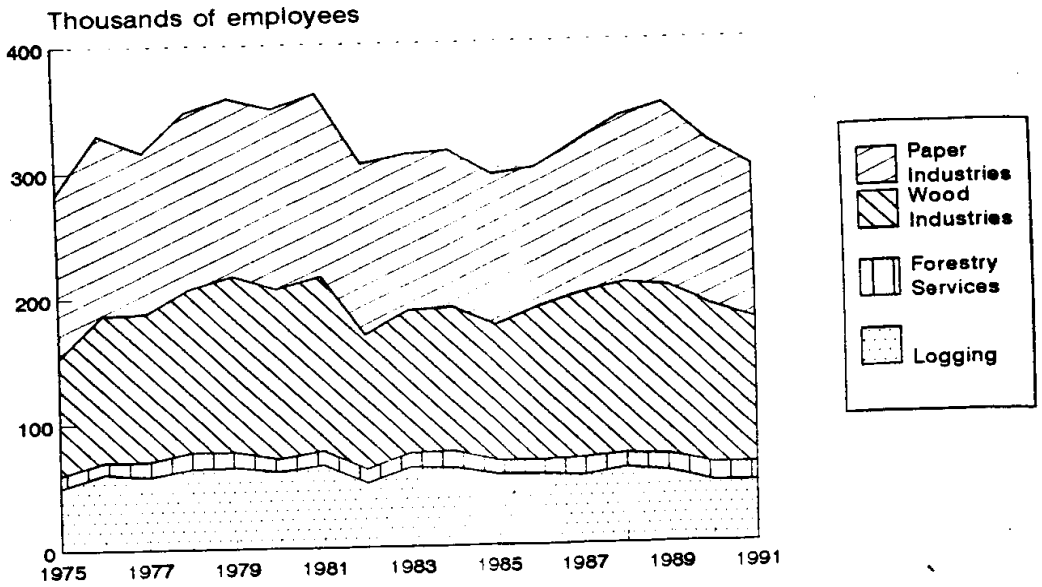
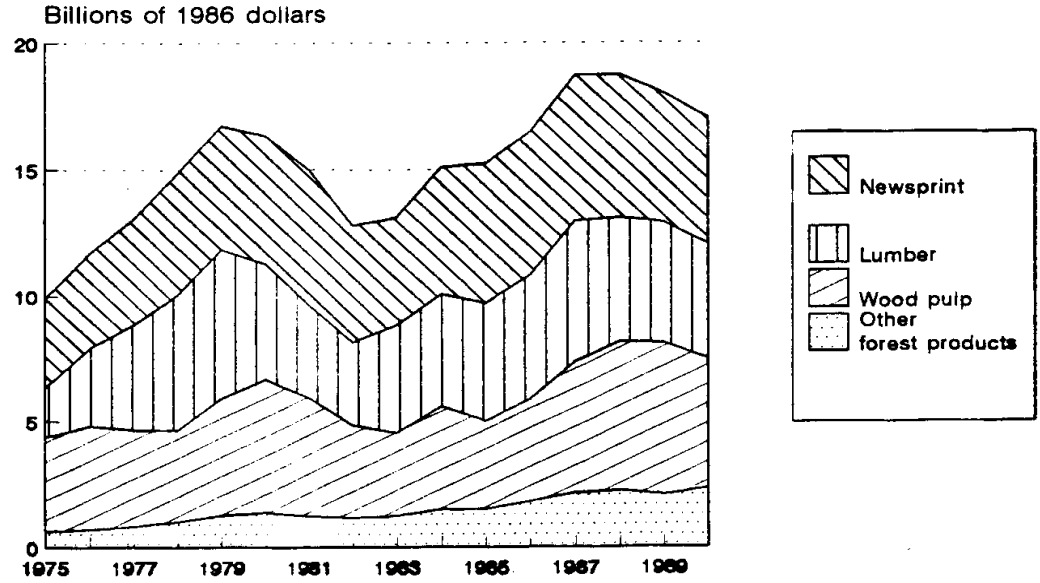
(9) *Ibid*., p. 45.

Figure 2
Employment by Forest Industry Sector



Source: Forestry Canada, 7 January 1992.

Figure 3
Forest Product Exports



Source: Forestry Canada, 7 January 1992.

Exchange rate fluctuations are another decisive factor in the sector's competitiveness. The rise in the value of the Canadian dollar relative to the US dollar has had a major negative impact on exports of forest products. Some analysts even believe that the $0.87 Canadian dollar in 1991 resulted in losses of between $60 and $100 a tonne, depending on the category of forest product.(10)

Raw material supply problems, fluctuations in world demand and technological applications are some of the factors that can affect the forest industry's performance. The problems of the Canadian forest industry clearly do not stem solely from the current recession; they are also structural.

A. Supply Problems

The supply of forest resources has been and will continue to be a key factor in the growth of the wood processing industry. In recent decades, however, inadequate forest management has upset the supply of forest resources and led to higher wood prices. Commercially exploitable stands are located further and further from existing mills and consequently wood that can be economically harvested is becoming increasingly rare. Furthermore, stocks of high quality wood, such as large-diameter hardwood logs, have already dropped considerably. Since reforestation is a new concern of the forest industry, manufacturers must now go long distances to obtain the raw materials they need. This in part explains the rise in wood prices since the early 1980s. The increase in the price of Canadian wood also reflects higher stumpage fees in a number of provinces.

The forest industry's shortage of raw materials is aggravated by problems with insects, disease and fire. Forestry Canada estimates that, every year, fire, insects and disease ravage a volume of wood equivalent to the volume harvested.(11) But the forests that replace those destroyed by natural disasters are often less satisfactory; they do not always regenerate with sought-after species, their density is often lower and they may prove to be less resistant to insects and disease.

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(10) Jean-Guy Morin, "L'industrie des pâtes et papiers demande le gel des salaires à ses employés syndiqués," *Le Journal de Montréal*, 15 January 1992, p.31.

(11) *The State of Forestry in Canada* (1991), p. 25 and 59.

Current productivity of Canadian forests is 60% lower than that of Swedish forests and is also lower than that of American forests. Canada's comparative advantage in the forest industry, which stems from the abundance of the forest resource in this country, could be eroded if we do not manage to maintain an adequate supply level.

This problem can be solved through proper forest management measures, however. On the whole, forest regeneration and technological advances permitting more effective use of our forest resources or easier access to a currently less-accessible stands are just some of the factors that will influence the supply of wood and the growth of the forestry sector in Canada.

B. Trade-Related Factors

Since the industry exports a large proportion of its production, it is extremely vulnerable to fluctuations in world demand. The newsprint sector is a striking example of this vulnerability. U.S. demand largely determines the size of the Canadian newsprint sector, but 43% of newsprint consumed by the United States currently comes from American paper mills. This is twice the 1985 figure and this trend is likely to continue.(12) Newspaper sales in the United States are also losing steam. U.S. demand for Canadian newsprint will therefore probably increase only slightly in the coming decade. The costs of our paper mills will also likely increase further because some U.S. states are demanding a minimum content of recycled fibres in their newsprint.

The competitiveness of the Canadian paper sector vis-à-vis foreign paper mills has also deteriorated. The current capacity of paper machines in Canada is lower than that of American and Scandinavian machines. It is true that Canadian paper mills are several decades old. In Quebec, for example, approximately two-thirds of paper machines have been in operation for more than 60 years. The productivity of Canadian paper mills is therefore lower than that of their competitors. For example, it costs $122 in labour to produce a tonne of paper in eastern Canada, but only $80 in the southern United States.(13) This discrepancy would seem to be attributable more to the age of the machines than to differences in wages.

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(12) Gilles Lavoie, "Les causes du déclin de notre industrie papetière remontent aux années 1970," *Les Affaires*, Montreal, 21 December 1991.

(13) Canadian Press, "Un rapport sur l'industrie forestière prédit des fusions, d'autres fermetures et une réorientation," *La Presse* (Montreal), 14 January 1992, p. C-8.

The other sectors of the forest industry that are highly export-oriented are experiencing similar problems. Some sectors realize few economies of scale because of the small size of companies, while other sectors are at a disadvantage vis-à-vis competitors whose forest resources are more abundant, of better quality and more varied than Canada's. In addition, many of the mills in Canada are not using the most modern equipment.

Even the forest industry sectors that export little still face stiff international competition. The output of those sectors that primarily supply the domestic market usually follows the general trends in economic growth. However, because these sectors are frequently fragmented and made up of small firms, they have a low scale of production, putting them at a disadvantage with their foreign competitors in terms of productivity, economic return and marketing opportunities.

It should also be pointed out that international trade in some forest products has long been subject to protectionist policies. This is particularly true of converted wood and paper products and high value-added products. The gradual elimination of tariffs under the Canada-U.S. Free Trade Agreement will therefore lead not only to new opportunities because it will give us access to the vast American market, but also to a rationalization of operations and restructuring in some sectors of the industry. Tariffs on a range of forest products will be totally eliminated by January 1993.

C. Technological Profile

In general, wood processing plants in Canada are older and therefore less technologically sophisticated than those of our competitors in the United States, Finland and Sweden. For example, Canada's millwork sector (doors, windows, kitchen cabinets, etc.) is less automated and less mechanized than that of the United States. Similarly, most Canadian hardwood sawmills are small operations that do not use the most up-to-date high-speed, electronically controlled equipment.

Other sectors have been better able to integrate the new technologies into their production processes. For example, the wood shingles sector uses hydraulic splitters and automatic splitter guides, thereby reducing the number of operations per production line and resulting in productivity gains. For some product lines, the converted paper industry imports its production machinery and is currently using the latest equipment. Canadian manufacturers'

R&D initiatives are limited to market needs and are aimed specifically at improving products and processes rather than at conducting basic research. In the pulp and paper sector, the adoption of new pulp production techniques (such as thermo-mechanical and chemi-thermo-mechanical pulp) has made it possible to substitute, in part, wood chips from sawmill waste for logs. The use of such techniques provides for a better use of forest resources and reduces the cost of processing. Softwood sawmills, for their part, earned an international reputation for their state-of-the-art techniques in the 1970s. However, the technological trend is moving toward the Scandinavian industry, which is using micro-electronic processing equipment to optimize the yield from saw logs and the value of products.

Technology in the forest industry has changed rapidly over the last few decades and new or modernized plants are much more efficient than those still using antiquated equipment. A number of new processing and production techniques are available throughout the world and many innovations are the subject of technology transfers. However, a large number of Canadian companies are small operations that do not have sufficient capital to acquire new innovations. Furthermore, a number of firms feel that the investments required to modernize their facilities would not be cost-effective at the present time. Since the modernization and restructuring of mills is not as advanced in Canada as in some competing countries, productivity has not increased at the same pace. This is the case for many firms in the wood and pulp and paper sectors. Moreover, machinery, tools and state-of-the-art equipment frequently come from foreign suppliers in Germany, the United States, Great Britain and Italy, who carry out the R&D.

In order to remain competitive, the forestry sector will have to keep pace with state-of-the-art technology. Conducting R&D is one of the ways of meeting this challenge. The following section provides a detailed description of the R&D efforts of the Canadian forest industry.

RESEARCH AND DEVELOPMENT

In Canada, forest sector R&D is carried out by the private sector, by cooperative laboratories, by the federal and provincial governments and by universities. Each of the players has its own R&D strong points. Generally speaking, basic research is conducted in universities and government laboratories, whereas applied research is carried out by cooperative research institutes. Developing new techniques is essentially the responsibility of equipment suppliers, while product development is primarily the responsibility of forest companies.

At the federal level, the largest contributor to forestry R&D is Forestry Canada. The Department operates six regional centres devoted to R&D activities linked to environmental problems and forestry management in the respective regions. These regions are: the Pacific and the Yukon, the Northwest, Ontario, Quebec, the Maritimes, and Newfoundland and Labrador. The Department also operates two institutes which focus on pan-Canada forestry issues. The following is a list of the principal research activities as well as the budgets allocated to each project category for the 1990-1991 fiscal year:(14)

> Forestry environment. This category includes areas such as the impact of forestry practices and environmental pest control; the impact of atmospheric pollutants and climatic change on forests; plant and forest ecology; techniques for fertilizing forested areas; reforestation; forest productivity; species yield; experimental plantings; silvicultural systems and forest biomass. Nearly $12 million has been allocated to this activity.
>
> Improvement of wood supply (protection). This activity involves conducting a survey of pests and tree diseases and analyzing the effects of forest fires on the wood supply and on forest ecosystems. The budget for this activity is more than $5 million.
>
> Evaluation of the forest resource. Activities include the collection and analysis of forest resource statistics. In total, just over $ 1 million has been allocated for this activity.
>
> Improvement of wood supply (production). This area of activity includes research into forest seedlings, species genetics, pest control and chemical insecticides. Approximately $14 million has been budgeted for this activity.

The forest sector also has three cooperative research laboratories involved in very specific areas and funded in part by member firms. They are: the Forest Engineering Research Institute of Canada (FERIC), Forintek, and the Pulp and Paper Research Institute of Canada (Paprican).

FERIC was established following the merger in the early 1970s of part of the Canadian Forestry Service and Paprican's forestry division. Funded equally by the government and forest firms, FERIC works exclusively in the field of harvesting and silviculture. Its R&D activities are focused primarily on development and are aimed at improving the efficiency of

(14) Forestry Canada, *Research Activities of Forestry Canada, 1990-1991*, Ottawa, 1991.

harvesting operations and minimizing the cost of the wood used by the manufacturing sector. FERIC conducts research into the following areas: forest yield, road design and construction, harvesting, secondary transportation, silviculture operations and engineering design.(15)

Forintek was established following the merger and privatization of two government laboratories in 1979. It is funded by Canadian wood-product firms, the federal government and the governments of British Columbia, Alberta, Manitoba, Quebec, New Brunswick and Nova Scotia. However, it relies more on government than on the private sector for its funding. Forintek, which operates laboratories in Vancouver and Ottawa, is concerned with wood-processing technology and with wood products. It is involved mainly in sawmill processing, construction systems, composite panels and laminated veneers, processed products, secondary processing and identification of properties of wood.(16)

Paprican, on the other hand, is largely funded through the annual contributions of pulp and paper companies. This research institute concentrates mainly on projects associated with pulp and paper production. While some of its activities focus on basic R&D and applied research of a pre-commercial nature, most of its efforts are directed to applied research and achieving improvement at all levels: improved productivity, improved procedures, development of new products, energy savings and environmental protection. Paprican's activities have expanded considerably in recent decades.(17)

R&D FUNDING AND PERFORMANCE IN FORESTRY

A breakdown of total R&D contributions in the forestry sector in 1988, showing the expenditures of both the funding sources and the performers, shows the R&D expenditures totalled nearly $351 million in 1988 (see Table 3). Industry was the main funding source, contributing $166 million, or 47% of the overall amount. The federal government also contributed to funding forestry R&D, providing approximately $106 million, or 30% of all R&D amounts. Provincial governments, for their part, provided some $44 million, or 12% of total expenditures in this field. Universities committed a total of $7 million, or 2% of overall R&D funding in forestry.

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(15) FERIC, *1990 Work Program*, p. 15-64.

(16) Forintek, *Progress and Achievement*, 1990-1991.

(17) Paprican, 1988 *Annual Report*, p. 18-28.

The forest industry was the leading R&D performer in 1988, accounting for 54% of all research activities carried out in the country. The federal and provincial governments accounted for 17% and 9% of R&D, respectively. Cooperative research institutes carried out 13% of activities in this field, while universities accounted for 8%.

Table 4 provides a breakdown of the various sources of funding for R&D carried out by industry and by research institutes in 1988. Performers funded nearly 73% of their own R&D expenditures. The second-largest contributor of funds was the federal government, with 11% of the overall total. Industry also accounted for the largest share of funding of R&D carried out by the three cooperative research institutes, while the federal government funded 22% of R&D activities conducted by research institutes.

THE TECHNOLOGICAL EVOLUTION OF THE FOREST INDUSTRY

R&D activities in forestry have undoubtedly contributed to the technological development of the Canadian industry. For example, new procedures in the lumber and plywood sector have led to expanded production options and increased manpower productivity. Other R&D activities in this area have put new wood products on the Canadian market, in particular, a broad range of plywood products.

Similarly, noteworthy advances have been made in the paper and associated products sector, particularly with respect to bleaching techniques, pulp production and paper processing. One of the biggest technological changes in this sector was the improvement of the paper machine through computerization, and use of sensors and activating devices. These new techniques increased the speed of the machine and enhanced fibre utilization.

Canada has, therefore, participated in the technological development of the forestry industry. A few decades ago, it was even one of the leaders in such fields as pulp bleaching and paper manufacturing. The pace of technological change in the forest industry has been stepped up virtually everywhere in the world, however and, unfortunately, fewer and fewer Canadian forestry companies compete on the cutting edge of technological change. Today, countries such as Finland, Germany, Sweden and the United States enjoy a comparative advantage in terms of forest technology. Canada appears to have neglected the investment in technology needed to develop and maintain this sector. In this respect, international comparisons speak volumes.

TABLE 3
TOTAL R&D EXPENDITURES, 1988
(in millions of dollars)

	Funding	Performers
Federal government	105.7	59.4
Provincial governments	43.8	30.2
Universities	7.0	29.0
Industry	166.0	187.7
Research institutes	–	44.3
Others	28.1	–
Total	350.6	350.6

Source: Forestry Canada, *The State of Forestry in Canada: 1990 Report to Parliament*, 1990, p. 64.

TABLE 4
R&D IN FORESTRY PERFORMED BY THE INDUSTRY
AND BY COOPERATIVE RESEARCH LABORATORIES, 1988
(in millions of dollars)

Sources of Funds	Performers	
	Industry	Research Institutes
Federal government	21.3	9.7
Provincial governments	5.6	3.5
Industry	136.3	28.7
Others	24.5	2.4
Total	187.7	44.3

Source: Forestry Canada, *The State of Forestry in Canada: 1990 Report to Parliament*, 1990, p. 64.

For example,[18] Canada devoted about 0.85% of its total sales of forest products to forest research in 1985. By comparison, the proportion for Sweden was 1.75%. In looking at the industry's record, we can see that, in 1988, the Canadian industry invested 0.34% of the total value of forest product sales, or approximately half as much as Sweden.[19] Even small countries such as Switzerland and the Netherlands spend more than Canada, comparatively speaking, on forestry R&D. Scandinavians in particular have enjoyed some measure of success in the area of applied research. For example, they have practically taken the lead in the international market in the design and production of wood-processing equipment. Furthermore, Sweden and Finland have research laboratories that are similar to the cooperative research institutes in Canada but conduct twice as much research. Yet the forest industry in these countries is half the size of the Canadian industry.[20] Moreover, virtually all of the paper mills in Sweden, Finland, Germany and Japan have their own internal research facilities. In Canada, on the other hand, only one pulp and paper company, MacMillan Bloedel, operates its own research laboratory. According to Mardon, the research laboratory operating budget of the four largest companies in Japan is equivalent to that of Paprican.[21]

To a certain extent, the declining competitiveness of the Canadian forest industry can be attributed to the low levels of research being carried out by cooperative research laboratories and business. Analysts suggest that this poor showing is caused by a number of factors, notably the behaviour of business leaders, the lack of technological expertise, low manpower levels in the R&D field, the presence of foreign businesses, the lack of technology transfer mechanisms, and finally, insufficient government incentives.

Some feel that business leaders have always given only secondary consideration to technology issues. They believe Canadian firms have placed greater emphasis on minimizing costs than on maximizing the value of the products they make. Canadian firms also apparently report a much higher dividend/profit ratio than American companies, thus substantially restricting the re-investment of profits in the modernization of infrastructures, R&D and technological innovation.[22]

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(18) Standing Committee on Forestry and Fisheries, *Forests of Canada: The Federal Role*, November 1990, p. 85.

(19) Canadian Press, "Pulp and Paper Industry: Canadian Cuts in R&D Threaten Competitiveness, Says Swedish Expert," *The Ottawa Citizen*, 31 January 1992, p. C-7.

(20) Rollin Milroy, "Mardon Speaks Out on R&D Crisis," *Pulp & Paper Canada Magazine*, St-Laurent, PQ, 30 November 1991.

(21) *Ibid.*

(22) *Le Point*, Société Radio-Canada, 16 December 1991.

Others note that although Canadian firms may benefit from new technologies, in particular foreign technologies, many of them lack the required technical expertise; some are unaware of technological advances made abroad while others are incapable of adopting or adapting these technologies.

This lack of know-how may be explained in part by the shortage of specialized workers capable of understanding this technology. Similarly, there is a correlation between the level of R&D and the human resources assigned to it. Compared to other countries, Canada employs few workers in the field of R&D. For example, in 1985, the U.S. firm Weyerhauser employed approximately 500 R&D professionals at its Tacoma facilities, or about twice the total number of R&D professionals employed by all Canadian firms.(23)

Some analysts also maintain that inadequate funding of domestic R&D can be explained in part by foreign ownership.(24) For example, it has been argued that the majority of U.S. forest product companies based in Canada have centralized their R&D investments in the United States.

The lack of effective technology transfer mechanisms is another reason why Canada is lagging behind its main competitors in terms of adopting innovative techniques. This deficiency limits exchanges between the users and the creators of new technologies. It would appear that companies do not have the information they need.

Lastly, some are critical of government policy with respect to innovation, claiming it does not sufficiently encourage R&D. Others, however, contend that government funding of research itself is adequate, but that more could be done to help companies with the development and marketing of prototypes, a stage of the innovation process that frequently requires an enormous investment.

Still others believe that the recently announced environmental regulations place industry at a disadvantage because governments have not proposed parallel measures to offset the effects of these policies. Supporters of the new environmental policies respond, however, that the introduction of these regulations will enable industries to remain competitive on world markets.(25)

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(23) Roger Hayter, *Technology and the Canadian Forest Product Industries: A Policy Perspective*, Science Council of Canada, Background Study 54, January 1988, p. 82.

(24) *Ibid.*, p.79.

(25) Government of Canada, "New Federal Regulations to Control Paper Mill Pollution," Press Release PR-HQ-091-45, Ottawa, 4 December 1991, p. 2.

CONCLUSION

The Canadian forest industry is obviously suffering the worst crisis in its history. Many analysts are examining the situation closely, searching for the causes of the forest industry's woes. The majority, including industry representatives, blame the problems essentially on the economy, while others see them as more structural in nature, though certainly compounded by the recession of the early 1990s.

Clearly, cyclical economic factors have a great deal to do with the difficulties plaguing the industry. The value of the Canadian dollar, interest rates that remain higher than those in the U.S. and manpower and transportation costs affect the competitive position of Canadian companies, whose raw materials and products must be shipped over great distances, thereby incurring high fuel costs. Even electricity, cheap and abundant not so very long ago, is now a contributing factor to the declining competitiveness of the Canadian forest industry.

Yet, though the economic factors adversely affecting this industry are cyclical, structural factors must also be considered. Relying primarily on its comparative advantages, which have continued to be eroded, and on a policy of the lowest possible price, the Canadian forest industry has, in the opinion of many observers, invested too little in equipment modernization, in R&D and in more specialized manpower training. As the industry grapples with excessive production costs, the competitive gap between the Canadian industry and its rivals continues to widen.

The industry has, nevertheless, invested relatively substantial sums in plant modernization, particularly in the pulp and paper sector, For example, according to the Canadian Pulp and Paper Association (CPPA), a total of $25 billion has been invested in modernization and expansion activities since 1985, resulting in the installation of 26 new paper machines and in the construction of six new pulp mills. Specifically, a total of $4 billion was invested in modernization efforts in 1989, a further $3.2 billion in 1990 and $1.3 billion in 1991. The CPPA predicts investments will be $1.27 billion in 1992, $1 billion in 1993 and $695 million in 1994. Economist Kevin McElhatton of the CPPA attributes this projected decline to a drop in company revenues and to the fact that firms have had to allocate much more money to environmental protection.(26)

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(26) Claude Turcotte, "Pas de profits en vue cette année pour les pâtes et papiers," *Le Devoir* (Montreal), 24 January 1992, p. A-6.

Be that as it may, the blame cannot be placed solely on the Canadian forest industry. Shortcomings plague the entire R&D sector in Canada. There is much ground to be made up in this area and, in the case of the pulp and paper industry, time is running out. It is estimated that in five years' time it will be too late to save the industry which, only recently, provided, directly and indirectly, such a large number of jobs across Canada.(27)

Nevertheless, the prospects for the technological development of the forest industry are enormous. New technologies could lead to cost reductions, energy savings, the development of better equipment and the creation of high value-added products, while reducing the pressure on the forest resource. To achieve this objective, it is essential that Canadian firms step up their R&D efforts, if they wish to be productive and competitive. However, meeting the challenge of new technologies will require a tremendous input of capital.

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(27) Rollin Milroy, "Mardon Speaks Out on R&D Crisis," *Pulp and Paper Canada Magazine*, St-Laurent, PQ, 30 November 1991.

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