Historical trends and outlook for the North American forestry sector: implications for the Great Lakes forest area[1]

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SUMMARY

This paper presents an overview of trends in forest products markets in North America and describes how forest products markets may evolve over the next decade or so. It then describes how the North American forestry sector is being shaped by trends within and outside the region and suggests how the forestry sector might adapt to these developments.

Forest products markets constantly adapt to changes in economic conditions, technology and government policies. In recent decades, changes in technology have had a profound impact on forest products markets all over the World. These have led to changes in the availability of raw materials, most notably the increased supply of plantation grown wood. On the demand side, they have led to changes in the way that roundwood is processed to meet users demands, such as an increase in the use of reconstituted panels. Government policies have also had a major impact on markets, with the introduction of environmental policies and laws and trade and economic liberalisation, which has led to greater globalisation.

The main challenge when trying to assess the impact of these changes is to determine how much of the impact is a short-term shock to the market and how much represents a long-term structural change. It seems likely that some of the most important markets for the Great Lakes forest area may grow much less in the future than they have in the past and may even decline in some cases. Furthermore, there are a number of other driving forces that will present both challenges and opportunities in the future.

In the future, the success of the forestry sector in most developed countries is likely to be less dependent on the availability of wood and more dependent on the application of technology, skills and knowledge to turn wood into a highly valued product that customers want to buy. In addition, forest managers will continue to have to meet a broader range of demands, some of which may be commercialised. This paper describes some ways in which the competitive strengths of the forestry sector in the Great Lakes forest area might be changing and presents some examples of how it might be possible to take advantage of these changes.

Keywords: supply and demand forecasts, technological change, forest economics

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[2] The views expressed here are those of the author and do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

INTRODUCTION

Projections of the future supply and demand for wood and wood products are an important aid to planning and decision making in the forestry sector. Consequently, the Food and Agriculture Organization of the United Nations (FAO) carries-out periodic reviews of forest products markets in order to produce supply and demand projections.

Most of the projections presented here come from the FAO Global Forest Products Outlook Study (GFPOS), which was completed in 1998 (Zhu *et al*, 1998). The projections are based on the results of a number of different supply and demand models, which were developed by the FAO Forestry Department in collaboration with the University of Wisconsin and other partners. These models were used, along with forecasts of the underlying or explanatory variables contained in the models, to produce projections for the period 1995 to 2010.

Because these models were developed in the late-1990s, they reflect the structure of the forestry sector and forest products markets that prevailed at that time. However, recent developments in areas not covered by the models have caused some significant changes in the forestry sector that these forecasts have not captured (see Box 1). This is particularly true in the case of developed countries such as Canada and the United States of America.

Box 1 A health warning about supply and demand models

Models are, by definition, a simplification of reality. Most models of demand use very simple functions relating changes in consumption to changes in underlying economic variables (e.g. costs, prices and Gross Domestic Product or GDP). On the supply side, most models of roundwood supply are based on expected changes in the forest growing stock and, sometimes, costs and prices. Models of processed product supply are usually derived from either or both of the above, plus technical coefficients to account for conversion rates.

The reliability of projections in any sector is reduced by the presence of factors that can not be easily incorporated into the modelling framework. Unfortunately, there are a number of such factors in the forestry sector, such as the following:

Technological change: the statistical estimation of a demand function implicitly assumes that there have been no major changes in variables that might significantly affect demand but are not included in the estimation procedure. Many forest products can be substituted by other forest products or non-wood products, so changes in technology that make other products more or less competitive can undermine the reliability of using such functions to produce projections. In the processing sector, changes in technology and the development of new types of products can also reduce the reliability of projections of future production or the derived demand for industrial roundwood. Technological change may also increase potential roundwood supply by enabling the use of tree species previously considered to be non-commercial.

Government policies: roundwood supply is primarily driven by forest area and the biological growth of the forest, but it can also be significantly affected by government forestry policies. Regulations governing the management and utilisation of forests are common in most countries and frequently change to reflect political priorities. Models that include international trade also tend to treat trade as an issue that is driven by economic concepts such as comparative advantage in costs and prices whereas, in reality, government policies have a major impact on trade. Changes in both of these areas are difficult to predict and incorporate into projections.

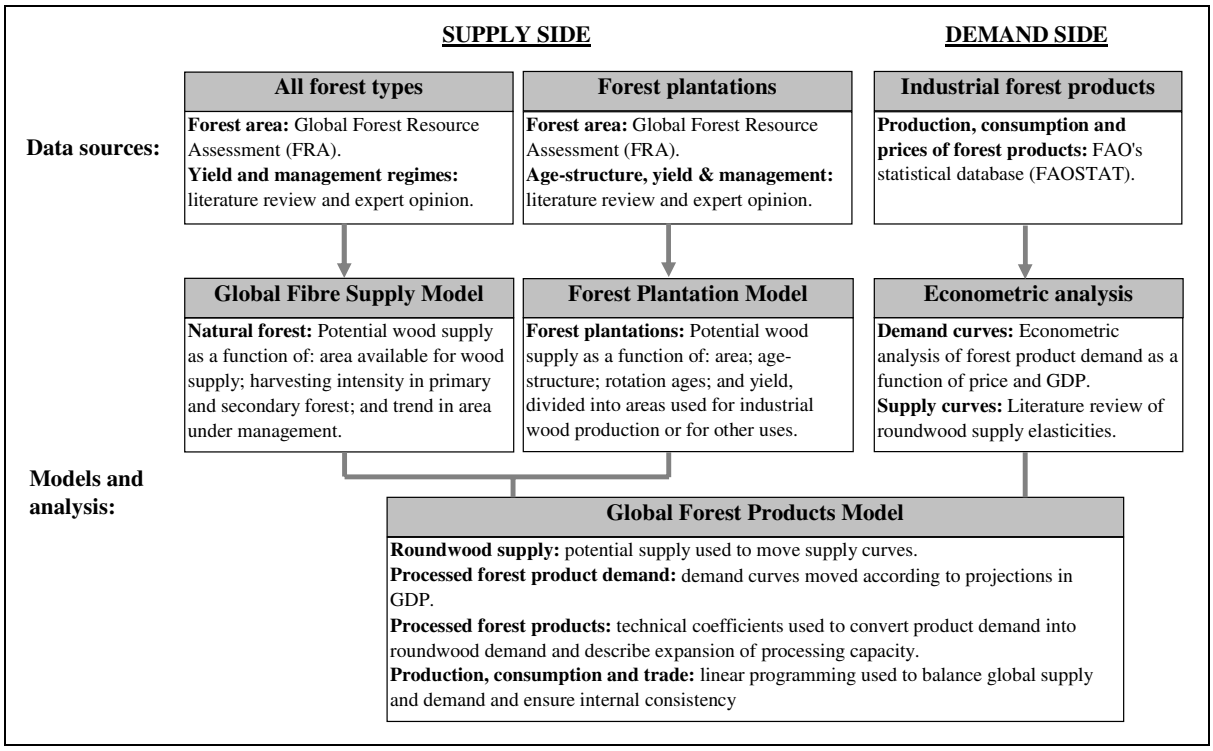
Broader socio-economic trends: most models of supply and demand are reduced to include only one macroeconomic variable - GDP - and they rarely include social trends, which are difficult to quantify and project into the future. Given the broad range of values attributed to forests and social and demographic changes, this is a further weakness of many models.

In addition to the above, these problems are magnified by the tendency of foresters to ask for projections that examine the distant future. This is why FAO produces "*outlook studies*" rather than just projections, which stress the need for a holistic approach to the analysis of the sector and present qualitative as well as quantitative descriptions of the future.

Modelling framework

The projections presented later on have been produced by combining the results of a number of analyses carried-out by FAO. An overview of all of the data, analyses and models used in the production of the GFPOS is given in Figure 1 and each of the individual components are described in greater detail below.

Figure 1 Overview of the models used in the Global Forest Products Outlook Study



Models of potential future roundwood supply: the Global Fibre Supply Model

On the supply side, FAO uses two models to forecast the potential future roundwood supply from forests. The first of these is the Global Fibre Supply Model (GFSM).

The GFSM is a model of future potential wood and fibre supply that covers the 78 largest wood producing countries outside Europe and North America. Countries in Europe and North America are not included in the model, because projections for these countries have already been produced in the fifth European Timber Trends Study (UN, 1996) and the North American Timber Trends Study (Boulter and Darr, 1996). However, it should be noted that the projections contained in these two studies are not entirely comparable to those produced by the GFSM, in that they are projections of expected actual supply rather than potential supply.

The GFSM is based on a comprehensive database that contains information about forest resources and recovered and non-wood fibre supply. Examples of the information contained in the database include: forest area and stocking; forest growth rates or potential yields; harvesting intensity; harvesting efficiency; levels of wastepaper recovery; and non-wood fibre pulping capacity.

For most countries, the information about forest resources is disaggregated into broadly defined forest types. The area of each forest type is also split into primary and secondary forest (i.e. areas that have been harvested or not) and areas that are potentially available for wood supply or are unavailable for a number of reasons (e.g. due to legal restrictions, biological factors, or reasons of economic or physical inaccessibility). For forest plantations, the model includes relatively simple information about area, species and potential growth rates or yield.

For each of the forest types available for wood supply in each country, the model calculates future potential wood supply as a function of forest area multiplied by harvesting intensity (in the case of primary forest) or yield (in forest plantations and secondary forest). In the absence of detailed age-class information (at the time the model was produced), it also applies gradually declining reduction factors to the potential supply from forest plantations, to take into account the currently immature age-structure of forest plantations in most countries. The projections of potential supply from all types of forest are also reduced to take into account harvesting efficiency.

In addition to these forest-based supply components, estimates of future potential wastepaper recovery and non-wood fibre utilisation are also incorporated into the final estimate of total potential wood and fibre supply.

The model can be used to produce projections of potential supply under a range of alternative assumptions about rates of deforestation, levels of harvesting intensity in primary forest, forest growth or yield in secondary forest and forest plantations and the expansion of the harvesting frontier into previously inaccessible forest. Changes in future rates of forest plantation establishment, wastepaper recovery and non-wood pulping capacity are also important variables that can affect future potential supply and scenarios for these variables can be examined in the model (for further information about the data and models used in the GFSM, see: Bull *et al*, 1998).[3]

Models of potential future roundwood supply: the forest plantation outlook study

In recognition of the limitations of the forest plantation supply analysis in the GFSM, FAO produced a more comprehensive analysis of the potential future wood supply from forest plantations in 1999 (Whiteman and Brown, 1999; Brown, 2000). This included the development of a more comprehensive and reliable database of forest plantations and the construction of a potential supply model. The new database contained better information about areas, species, utilisation (i.e. for industrial roundwood supply or for other uses), potential yields and typical management regimes; and the model was used to produce more detailed estimates of the current and future potential supply of roundwood from forest plantations.

The estimation of age-class profiles: a major component of the forest plantation outlook study was the estimation of age-class profiles to add to existing information about forest plantation areas and species distributions (Pandey, 1995 and 2002). This information was

[3] The scenario used in the analysis presented here is one of a continuation of past trends in most of these variables.

estimated for the 65 countries with more than 100,000 ha of forest plantations, which contain the vast majority of the World's forest plantation resources.

The estimated age-class profiles were based on information collected from a variety of sources, including: official national and international statistics; bibliographic references; project reports and expert opinion. However, for many countries, only partial forest plantation data was readily available and it was necessary to use a variety of techniques to fill-in missing data. While these manipulations undoubtedly produced age-class profiles of varying quality, they made it possible to construct profiles that were broadly representative of the forest plantations in each country and consistent with their reported statistics.

Modelling the potential supply of wood from forest plantations: given the quality of information available about many of the factors that influence wood supply from forest plantations, a relatively simple projection methodology was chosen for this analysis. The main pieces of information used in the model were: forest plantation area (disaggregated by species); the national forest plantation age-class profiles (grouped by 5-year intervals); and national estimates of increment (by species). Other information used in the model included information about typical rotation ages (by species) and indicative national mortality rates.

The model works on an annual basis. For each year of the forecast, the areas of each species that will be harvested and lost due to natural causes (in each age-class) are estimated from the information about rotation ages and mortality. It is assumed that these areas will be replanted immediately so, along with any new planting, these areas are placed into the 0-5 years age-class. At the same time, a proportion of the remaining forest plantation area in each age-class is moved into the next higher age-class. In order to estimate potential wood supply, the area of each species harvested in each age-class, is then multiplied by the mean annual increment for that species and the age at harvest (this calculation assumes that there is no thinning of forest plantations). These estimates are then summed to give total potential roundwood supply for one year and the process is started again for the next year of the projection.

<u>The use of the two potential roundwood supply models in the GFPOS</u>

Because the forest plantation outlook study was not completed until the end of the whole GFPOS exercise, only the results of the GFSM were used to make the projections of consumption and production presented in the GFPOS (and shown later in this paper). However, the forest plantation supply model is shown as an integral part of the modelling framework in Figure 1, because FAO is currently revising the GFPOS projections and the results of this model have now been incorporated into this exercise. In addition, the forest plantation outlook study has helped to provide an additional insight into developments in the forestry sector, which goes beyond the projections of forest products consumption and production.

As noted above, the GFSM produces projections of potential supply rather than actual supply. In nearly all cases, the former is much greater than the latter. Therefore, these projections were not included in the analysis as absolute amounts, but rather they were used as "*supply shifters*" or variables that describe how the roundwood supply curve (i.e. actual supply) is likely to move inwards or outwards in response to changes in the condition of the forest

resource in each country.[4] In the case of North America and Europe, the results of the two existing studies of these regions were also used in the same way. These projections, along with the projections of potential non-wood fibre supply from the GFSM, were used in the final stage of the analysis. However, the GFSM projections for recovered paper production were not used, because the last model used in this process incorporated this already as a component of projected paper consumption (see below).

The Global Forest Products Model

The Global Forest Products Model (GFPM) was the last stage in the GFPOS exercise. This brought together the projections of potential roundwood supply, an econometric analysis of historical trends in forest products markets and other information about forest product conversion rates and trends in capacity expansion, to produce the final projections of actual consumption and production that were presented in the GFPOS.

The GFPM produces projections of wood and wood product production, consumption and trade, which cover 14 product categories in each of the 180 largest countries in the world. The model is a market simulation model and is based on a linear programming algorithm. This simulates trade between countries, subject to the constraint that total world exports of each product must equal total world imports. Other constraints within the model ensure that the projections it produces are internally consistent (e.g. they ensure that projected industrial roundwood supply is sufficient to meet the projected level of finished product supply in each country, after allowing for trade in industrial roundwood).

The whole GFPM modelling process is quite complex (see Tomberlin *et al* (1998) for a more detailed discussion), but it can be simply explained as follows. The first stage of the process is to analyse historical data to estimate supply and demand elasticities for all countries in the model. Price elasticities are used to define the slope of the supply and demand curves that will be used in the model. Other elasticities (that measure the effect of variables that shift the supply and demand curves) are used to move the curves between adjacent years of the projection.

The model only requires demand elasticities for final products and supply elasticities for roundwood and non-wood fibre supply. Supply and demand curves for other components of the model (e.g. the supply of finished products and the derived demand for intermediate products and raw materials) are constructed from these within the model, using a series of technical coefficients.

The GFPM then creates a set of supply and demand curves for each product in each country in the base-year (the base-year is the last year for which actual data exists - in this case 1994). These are first located so that they match the actual production, consumption and trade figures recorded for the base-year. As part of this process, the model is calibrated (i.e. some of the internal parameters are adjusted) until it produces an internally consistent projection for all products in the base-year that is reasonably close to what was actually recorded.

[4] This is done by converting the projections of potential future roundwood supply to year-on-year percentage changes in supply that can be used in the later stages of the analysis.

The model then shifts all the demand and supply curves, according to the set of predetermined elasticities, in order to produce a new set of supply and demand curves for the next year of the forecast. At first, this produces a set of results that differ greatly, in terms of price, between countries (i.e. countries with high demand growth but low supply growth show very high prices and countries with low demand growth but high supply growth show low prices). However, the model then moves the supply curves around to simulate trade (i.e. countries with low prices export to countries with high prices) until prices start to converge. It should be noted that this process is price-endogenous, in other words projections of prices are produced as an output of the model (as a result of these shifts in supply and demand) and are not entered into the model as explanatory variables.

This process is subject to the constraints that the net supply in each country (i.e. accounting for the effects of trade) must equal domestic demand and that total world exports and imports must balance. It must also meet certain other constraints, such as the requirement for internal consistency noted above. This process of shifting the supply and demand curves and simulating trade in each year is then repeated for every year of the projection period.

The price and income demand elasticities used in the GFPM were based on an econometric analysis of production data taken from the Forest Products Yearbook (FAO, 1996 and earlier) and economic data taken from the World Bank STARS database (World Bank, 1993). On the supply side, estimates of the price elasticity of industrial roundwood supply were taken from the forest economics research literature. With respect to the roundwood supply-shifter, it was assumed that the roundwood supply curve in each country would shift in response to changes in expected actual supply (in the case of Europe and North America) or supply potential (in the case of all other countries), with an elasticity of 1.0. There is some evidence to support this assumption, for example Hyde and Newman (1991), in a comprehensive review of roundwood supply models, found that many analyses of timber supply have identified a supply elasticity of 1.0 or close to 1.0, with respect to biological measures of supply potential.

The economic growth projections used to shift the demand curves between years were taken from existing FAO research in this area (FAO, 1997). Projected shifts in the roundwood supply curves were taken from the results of the GFSM and the European and North American Timber Trends Studies.

The links between finished product demand, finished product supply and raw material demand in the model, are specified as a series of technical functions and coefficients, such as: roundwood to product conversion factors; estimates of manufacturing costs; capacity utilisation parameters; and wastepaper recovery rates. This information is used within the model to derive the demand curves for raw materials and intermediate products and the supply curves for intermediate and finished products. It is also used to derive some of the constraints used in the model.

The conversion factors used in the model were calculated from production and consumption figures contained in the Forest Products Yearbook. For example, if a country reports a level of sawlog inputs to its processing industry equal to twice the level of sawnwood output (and no plywood production), then a conversion factor of 2.0 would be derived. Estimates of manufacturing cost were also derived from these data by subtracting raw material input costs (e.g. roundwood prices multiplied by the conversion factor for a particular product) from

product prices. International trade prices were used throughout the analysis, by dividing the trade values reported in the Forest Products Yearbook, by reported trade volumes.

The projections presented here assume no changes in future technology, except that they assume that the recovery and utilisation of wastepaper will increase in the future at the same rate as it has in the past. While this may not be achievable indefinitely, this will be feasible in the period to 2010 and is likely to occur given the current emphasis on increasing recycling in many countries.

Structure of this paper

The rest of this paper falls into three main parts. First, four sections describe recent trends in Canadian and American forest products markets and present projections for each of these markets for the next decade. For this purpose, the forestry sector is divided into the solid wood processing sector (sawnwood and wood based panels), the pulp and paper sector and the forest management sector (production of industrial roundwood from natural forests and forest plantations). The last of these four sections presents a brief summary of all of these trends and projections and discusses their implications for forest products prices.

Following this, another three sections describe some of the driving forces underlying the current changes in forest products markets. These are divided into global trends, trends in technology and broader social and economic forces.

The last part of the paper presents some suggestions about how the forestry sector in the Great Lakes forest area might take advantage of some of these changes. It describes some of the possible opportunities for increasing the profitability of the sector by deepening value-added in the sector. It then describes some new and innovative ways in which alternative sources of income might be developed.

TRENDS AND PROJECTIONS FOR DEVELOPMENTS IN THE MARKETS FOR SOLID WOOD PRODUCTS

The solid wood products sector comprises sawnwood and wood based panels. The markets for each of these broad product categories can be further subdivided into many specific products, each with different characteristics. However, for the purposes of modelling supply and demand, only the following product categories are used in the GFPM: sawnwood; plywood and veneer sheets; particleboard; and fibreboard. At this level of aggregation, the analysis may miss some significant differences in the market trends for different types of products, but it should be sufficient to give a broad indication of future developments for the solid wood products sector as a whole.

Sawnwood

The production of sawnwood in North America uses just over half of all industrial roundwood produced in the region, but there is a large difference between Canada and the United States of America in the importance of this sector as a roundwood user. Since 1960, the proportion of industrial roundwood used for sawnwood production in the United States of America has fallen from 60 percent to 50 percent, but in Canada the share has increased from 50 percent to 80 percent over the same period. In terms of value, the importance of the sawnwood sector is even greater than these figures might imply, because of the higher value of sawlogs and veneer logs relative to pulpwood. Therefore, developments in this sector are of vital importance for the future of forestry in the region, particularly in the case of Canada.

Figure 2 shows the history of sawnwood production and consumption in Canada and the United States of America from 1961 to 2001 and projections for these four items from 1995 to 2010.

One of the first things that this figure shows is the cyclical nature of sawnwood production and consumption. This is caused by the business cycle, which tends to have a major impact on construction (one of the main markets for sawnwood).

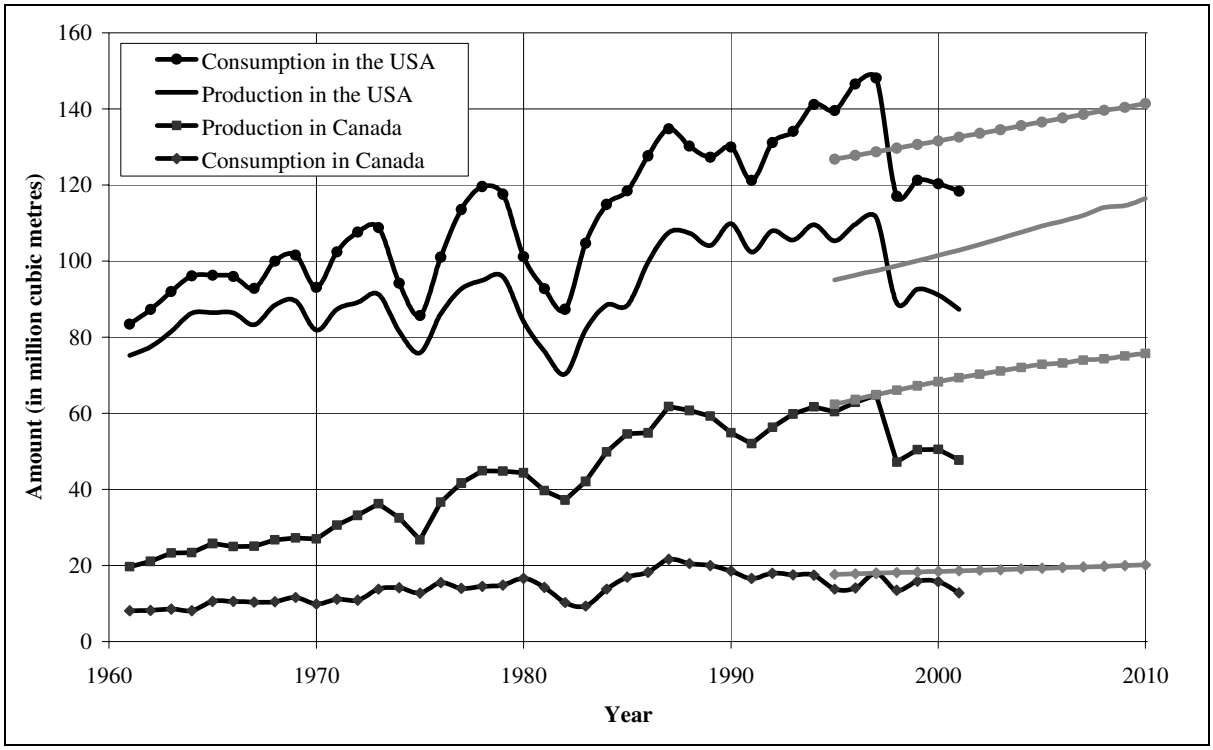
The figure also shows that, as is the case for most forest products, Canada is a significant net exporter of sawnwood and the United States of America is a net importer. Furthermore, given the differences in production and consumption growth rates in each country, the importance of international trade has increased over the period. Total exports of sawnwood from Canada have increased from 62 percent of production in 1961 to 76 percent of production in 2001, while imports into the United States of America have increased from 12 percent of consumption to 30 percent of consumption over the same period.

In terms of international trade in sawnwood, Canada and the United States of America also have one of the most significant trading relationships in the World. Sawnwood exports from Canada account for about 85 percent (by volume) of all sawnwood exported from Canada and 95 percent (by volume) of all sawnwood imported into the United States of America.

The consequence of this trading pattern is that developments in the sawnwood sector in Canada are strongly linked to developments in sawnwood markets in the United States of America. For example, the figure shows quite clearly that changes in Canadian production

follow changes in American consumption much more closely than changes in Canadian consumption

Figure 2 Trends and projections for the sawnwood sector in North America



Source: FAO (2003a), Zhu et al (1998).

In terms of identifying the trends in this data, there appear to have been three or four distinctly different periods in the development of sawnwood markets in the past:

- **1960s and 1970s** - highly variable growth in sawnwood production and consumption in the United States of America and sawnwood consumption in Canada, but with little or no overall growth; in contrast, Canadian production increased over the period with only one major recession;

- **mid-1980s** - high and sustained levels of growth in sawnwood production and consumption in both countries;

- **late-1980s to mid-1990s** - flat levels of sawnwood production in both countries, with an increase in consumption in the United States of America and a slight decrease in Canada; and

- **recent years** - a significant decline in sawnwood production and consumption in both countries.

The projections of future sawnwood production and consumption shown in Figure 2 are based on the market conditions prevailing in the mid-1990s. They show projected growth in sawnwood production of just under 10 million cubic metres (CUM) in both countries over the period 1995-2010. In terms of consumption, they show consumption growth of slightly less

than 10 million CUM in the United States of America and a very slight increase in Canadian consumption over the same period. However, given recent market developments, it now seems likely that these projections are far too optimistic.

The projections from the GFPM do not make any distinction between coniferous sawnwood and non-coniferous sawnwood, but developments in these two markets have been very different in Canada and the United States of America.

Figure 3 shows the historical trends in sawnwood consumption and production in Canada by species group. As this figure shows, non-coniferous sawnwood consumption and production is relatively insignificant (around 1 million CUM per year) and has not changed by very much in the past. Thus, although the non-coniferous forest resource in Canada is much smaller than the coniferous resource, there appears to be very little use of this for sawnwood production.

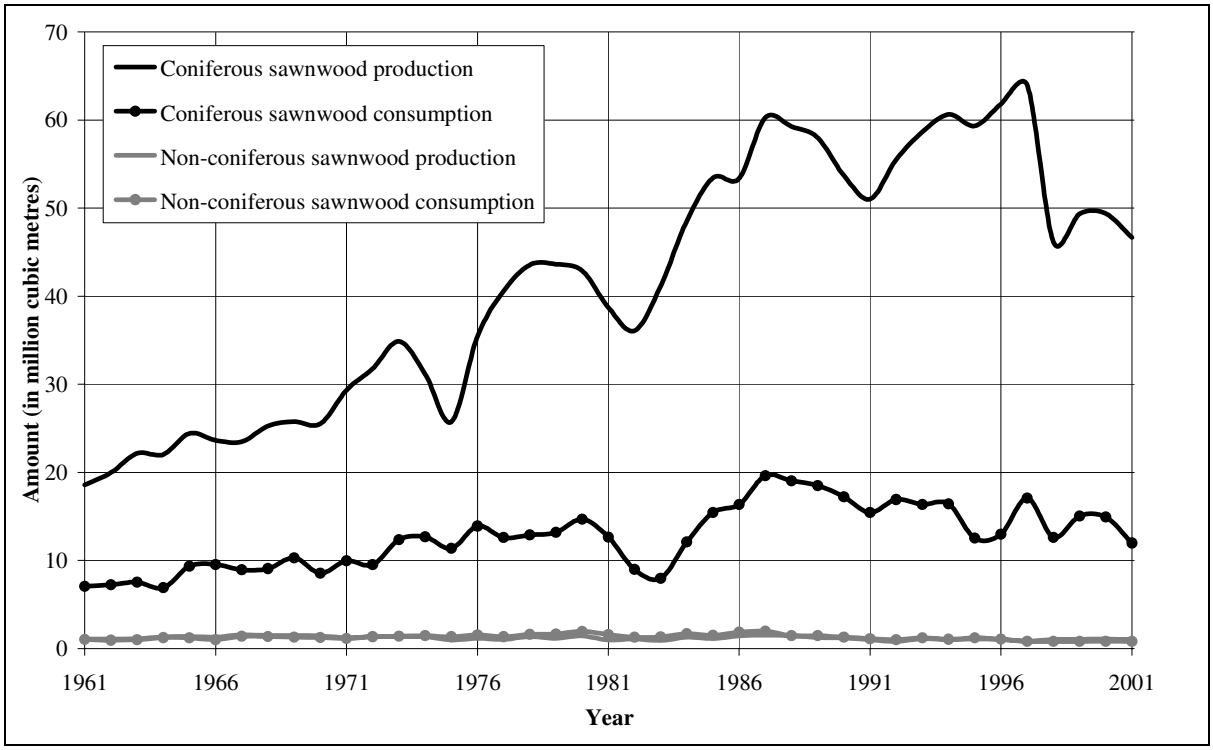
In contrast, the production of coniferous sawnwood has accounted for all of the growth in total sawnwood production in the past, increasing from 20 million CUM to 50 million CUM. Much of this growth in production has been exported (Canadian consumption has only risen from just under 10 million MT to around 15 million MT), leading to a high dependence on export markets for this sector in Canada.

In the United States of America, the situation is quite different (see Figure 4). Coniferous sawnwood production varied around a level of about 70 million CUM until the mid-1980s, when it increased to about 80 million CUM. Since the mid-1990s, production has fallen back to levels last experienced in the 1960s. Consumption has always been higher than production and this gap appears to have increased over the period. As the figure shows, the production of coniferous sawnwood in the United States of America (and Canada) is very much dependent on the trends in consumption in this market. The recent decline in consumption is undoubtedly the reason why production in both the United States of America and Canada has fallen back in recent years.

In contrast to the variability of the coniferous sawnwood sector, trends in the consumption and production of non-coniferous sawnwood are much less volatile and the sector appears to have experienced a small amount of sustained growth over the last 20 years. Until the 1980s, production of non-coniferous sawnwood was stable at a level of just under 20 million CUM per year. Since then, production has increased and now appears to have stabilised at a level of around 30 million CUM. Thus, non-coniferous sawnwood production now accounts for about one-third of total production in the United States of America.

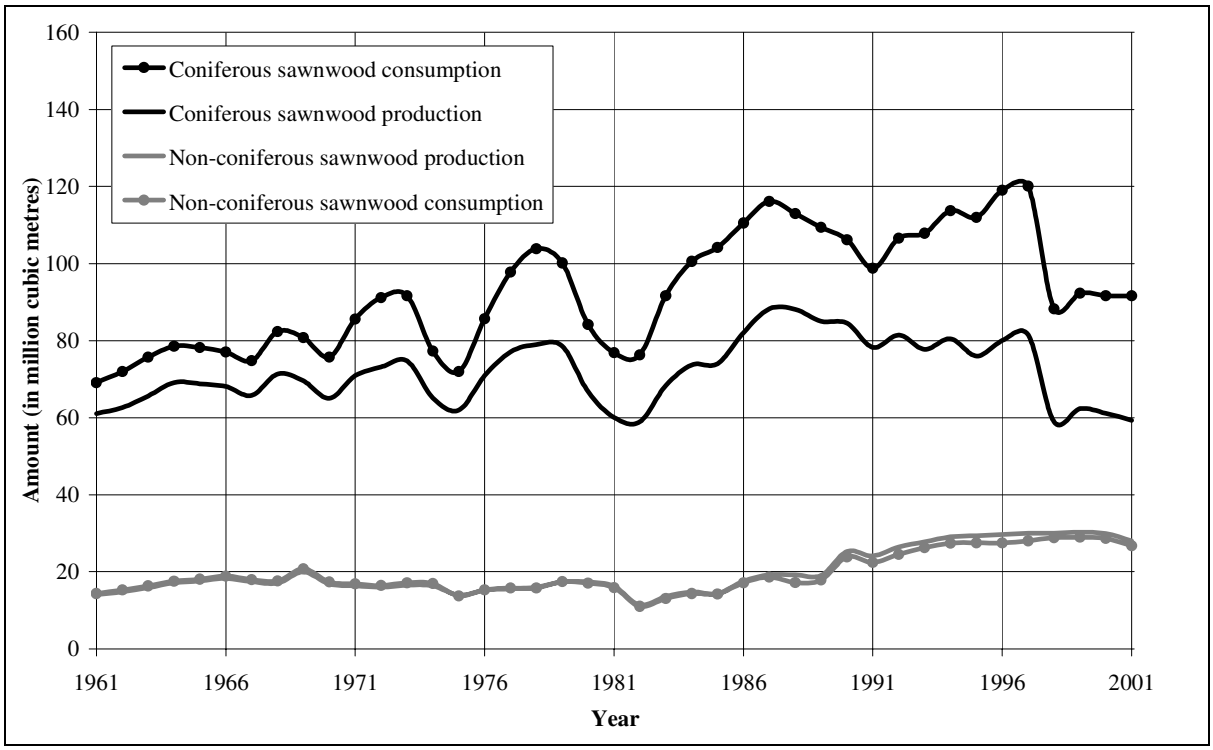
Much of this non-coniferous sawnwood production is located in the eastern and southern United States of America, so it is not particularly relevant for the Great Lakes forest area. However, it does show that there is scope to develop a market for non-coniferous roundwood if the opportunity arises and the conditions for growth are right.

Figure 3 Trends by species in the sawnwood sector in Canada



Source: FAO (2003a).

Figure 4 Trends by species in the sawnwood sector in the United States of America



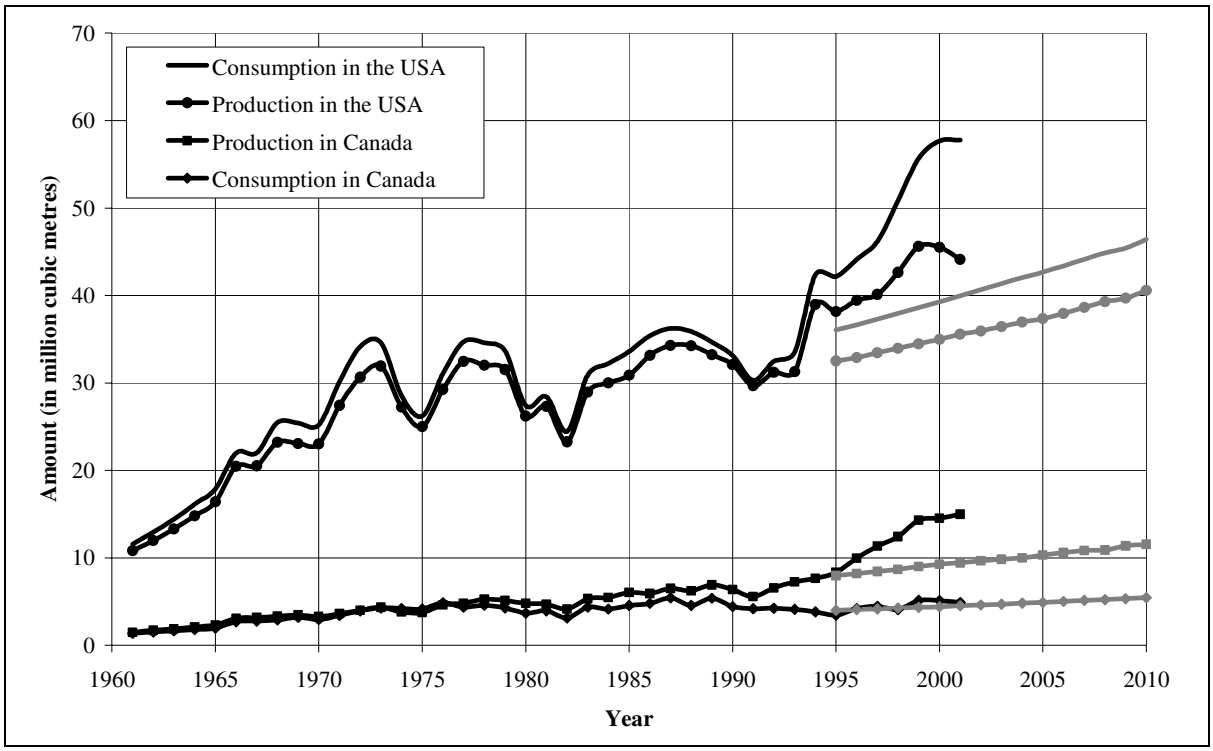
Source: FAO (2003a).

Wood based panels

In Canada and the United States of America, the wood based panels sector has grown in importance to become roughly equal to the pulp and paper sector as a user of industrial roundwood. Of the three main types of wood based panels, plywood and veneer sheet production has traditionally been the most important, both in terms of the quantities of industrial roundwood used and due to the fact that high quality (and, consequently, higher priced) roundwood is used in this sector. However, in recent years, the production of reconstituted panels (particleboard and fibreboard) has grown in importance.

Currently, the production of plywood and veneer sheets probably uses about five percent of industrial roundwood production in Canada and about 10 percent of production in the United States of America. Reconstituted panel production consumes a further five percent of industrial roundwood production in Canada and 15 percent of production in the United States of America.

Figure 5 Trends and projections for the wood based panel sector in North America



Source: FAO (2003a), Zhu et al (1998).

Figure 5 shows the shows the history of wood based panel production and consumption in Canada and the United States of America from 1961 to 2001 and projections for these four items from 1995 to 2010. Again, this figure shows that Canada is a net exporter and the United States of America is a net importer although, until recently, production and consumption levels have been quite close and international trade has been relatively less important than in the case of sawnwood.

The figure shows that production and consumption of wood based panels has grown substantially over the last four decades and far more rapidly than in the sawnwood sector. Although the consumption of sawnwood continues to dominate the solid wood products

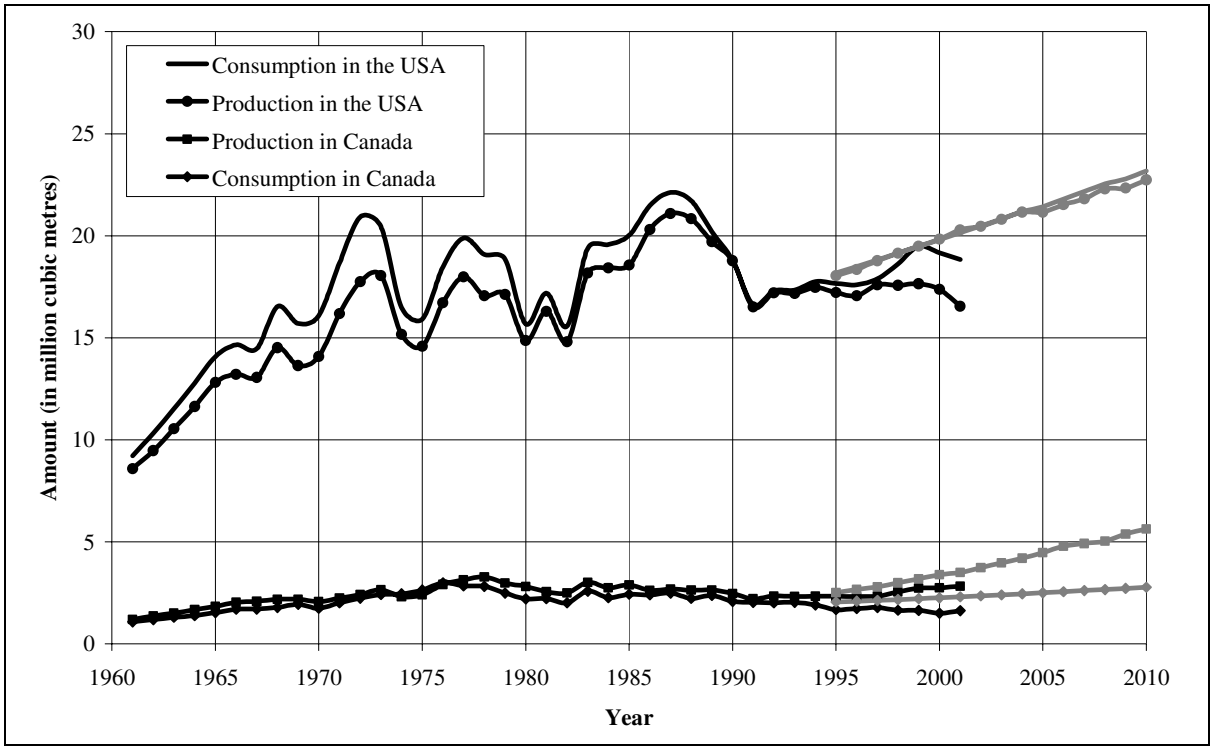
sector, the use of wood based panels is increasing at the expense of sawnwood consumption and now accounts for about one-third of total solid wood product consumption in both countries.

As with the sawnwood sector, historical growth in the consumption and production of wood based panels can be divided into several distinct periods. Until the mid-1970s, consumption and production grew significantly in both countries. Following this, production and consumption continued to grow in Canada but stagnated in the United States of America. Since the mid-1990s, production in both countries has increased dramatically, probably in response to the rapid growth in consumption in the United States of America.

The projections for production and consumption indicate strong growth in production in both countries, strong growth in consumption in the United States of America and slight growth in Canadian consumption. Although these projections indicate the general strength of developments in this sector, they appear to have seriously underestimated the prospects for growth in the future.

A more useful analysis of this sector can be obtained if the trends and projections for the three different types of wood based panels are examined separately and these are shown in Figure 6 to Figure 8.

Figure 6 Trends and projections for the plywood and veneer sector in North America



Source: FAO (2003a), Zhu et al (1998).

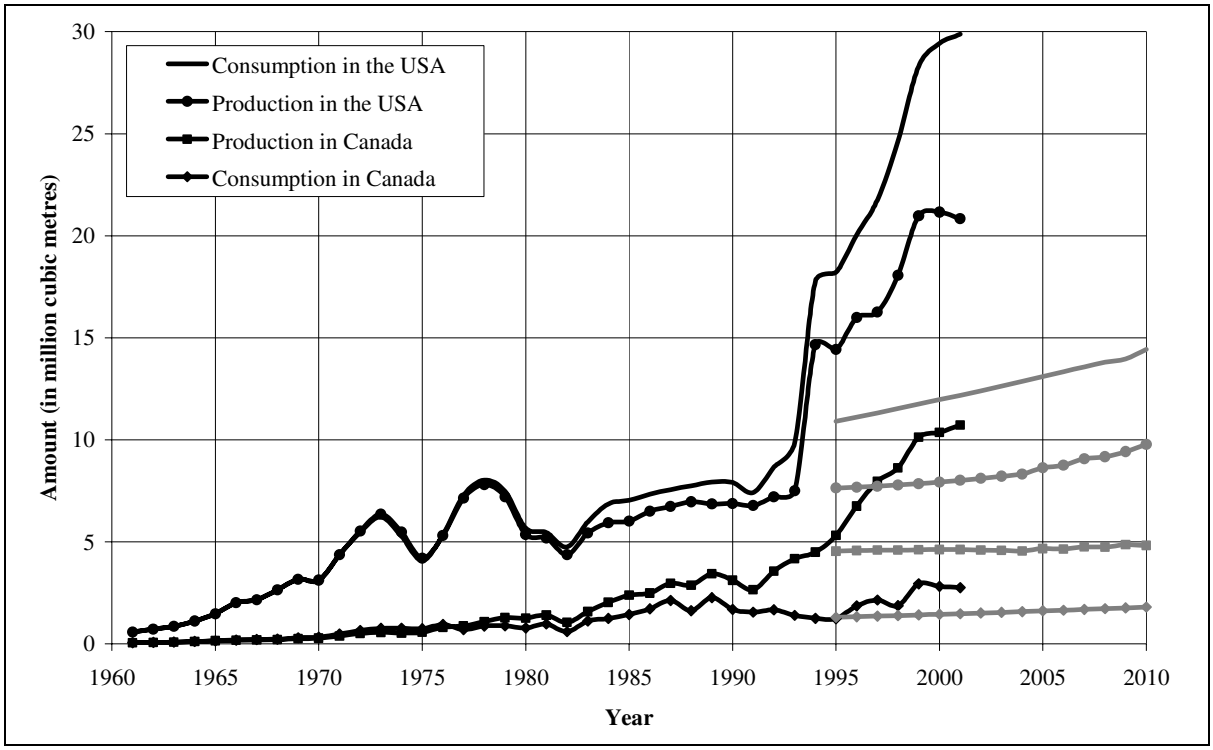
Plywood and veneer sheets

Production and consumption of plywood and veneer sheets grew strongly during the 1960s, but there has been little growth in this sector since then. As with the sawnwood sector, consumption and production of plywood and veneer sheets is very cyclical, so it is difficult to discern whether recent movements in the sector represent a trend or are just a result of cyclical variation.

In terms of international trade, exports of plywood and veneer sheets from Canada have grown in importance from about 20 percent of production in the 1960s to two-thirds of production in 2001. About 80 percent of these exports go the United States of America and a further 10 percent to Japan. In contrast, the importance of international trade in the United States of America has always been lower than this, with imports accounting for only about 15 percent of domestic consumption. These imports also come from a broader range of countries, including: Brazil; Malaysia; Indonesia; Russia; and Canada.

The projections for the plywood and veneer sheets sector suggest that there will be strong growth in both production and consumption in the United States of America of about 10 million CUM over the period 1995 - 2010, strong growth in Canadian production (about 3 million CUM over the same period) and only modest growth in Canadian consumption. In contrast, the evidence to date suggests that growth will be much less than projected. American consumption and Canadian production have grown by much less than these projections and American production and Canadian consumption have actually declined over the period. Thus, as in the sawnwood sector, these projections seem to be over-optimistic.

Figure 7 Trends and projections for the particleboard sector in North America



Source: FAO (2003a), Zhu et al (1998).

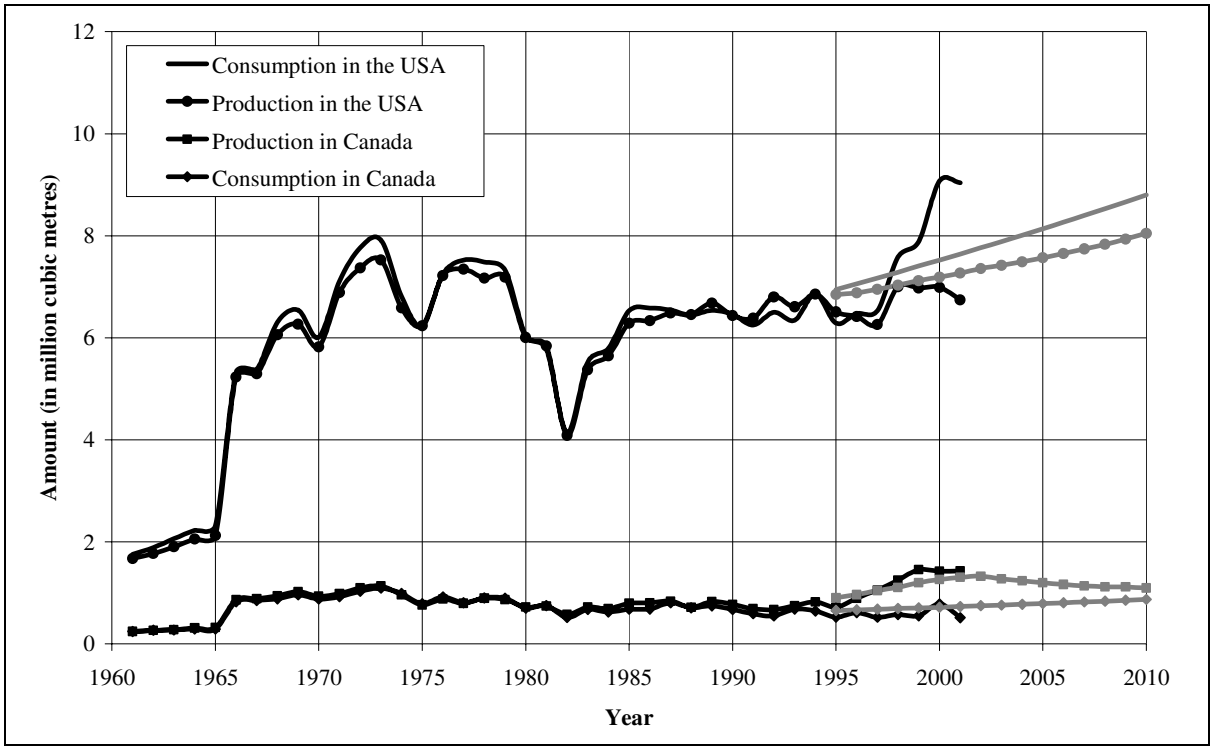
Particleboard

Until the early-1990s, trends in the particleboard sector show gradual but sustained growth in production and consumption in both countries. However, since the early-1990s, production and consumption have increased dramatically and by far more than the historical trends in this sector. This is undoubtedly due to the development of oriented strand board (OSB), which is a relatively new type of particleboard.

Figure 7 also shows that international trade is becoming more important for both countries. From a position of almost no international trade in either country until the mid-1970s, total particleboard exports have grown to account for about 80 percent of Canadian production in 2001 and imports now account for about one-third of consumption in the United States of America. Almost all exports from Canada go the United States of America, where they account for about 80 percent of imports. Other countries exporting to the United States of America include Sweden and Germany.

The projections for the particleboard sector have captured the importance of international trade in both countries, but suggest only relatively modest rates of growth in production and consumption in the future. The projections show growth in production and consumption in the United States of America of only around three to four million cubic metres over the period 1995 - 2010 and almost no growth in Canada. In other words, these projections have completely failed to capture recent technological developments in this sector.

Figure 8 Trends and projections for the fibreboard sector in North America



Source: FAO (2003a), Zhu et al (1998).

Fibreboard

Trends in the fibreboard sector show similarities to the other wood based panel sectors. After rapid growth in the 1960s, production and consumption have remained roughly constant in the United States of America and may have even declined slightly in Canada up until the mid-1990s. However, since the mid-1990s, fibreboard consumption in the United States of America has increased by about 50 percent and production has increased slightly. Production in Canada has more than doubled, presumably to meet some of this increase in demand.

Again, international trade has grown rapidly in importance. Imports of fibreboard currently account for about one-third of consumption in the United States of America. However, Germany is the largest exporter to the United States of America, accounting for about 50 percent of imports, while the Canadian share of imports is 40 percent. Another unusual trade pattern is that Canada currently appears to export almost all fibreboard production and relies entirely on imports to meet demand. Just over two-thirds of these imports come from the United States of America, so this is presumably due to differences in the location of processing facilities and consumers in Canada, resulting in a lot of cross-border trade.

The projections for this sector show strong expected growth in consumption and production in the United States of America, with an expected increase in production of just less than 1 million CUM from 1995 to 2021 and an increase in consumption of around twice this amount. For Canada, the projections suggest very modest growth in both consumption and production. The statistics for recent years show these projections to be broadly correct, although the growth in consumption in the United States of America currently appears to be much higher than expected.

TRENDS AND PROJECTIONS FOR DEVELOPMENTS IN THE MARKETS FOR PULP AND PAPER PRODUCTS

As with the solid wood products sector, the paper and paperboard sector covers a wide range of specific products, which differ in terms of prices, end-uses, quality and demands on the raw material supply. However, in the GFPM, the paper and paperboard sector is simply divided into three broad product groups: newsprint; printing and writing paper; and other paper and paperboard. While this simplification might miss some important market trends for specific products, these product groups are probably sufficiently different to capture most of the important differences in market trends affecting the various components of this sector.

The fibre used in the production of paper and paperboard comes from a variety of forest and other sources. The GFPM distinguishes between four types of fibre furnish, namely: mechanical wood pulp; chemical wood pulp; non-wood fibre pulp;[5] and recovered paper (or wastepaper). Demand for each of these products is estimated in a different way to the other processed forest products included in the model, because their demand is derived from the demand for paper and paperboard. In addition, on the supply side, recovered paper is included in the model as a function of paper consumption and non-wood fibre pulp is estimated using a simple trend analysis, in recognition of the fact that neither of these fibre sources come from forests.

Wood pulp

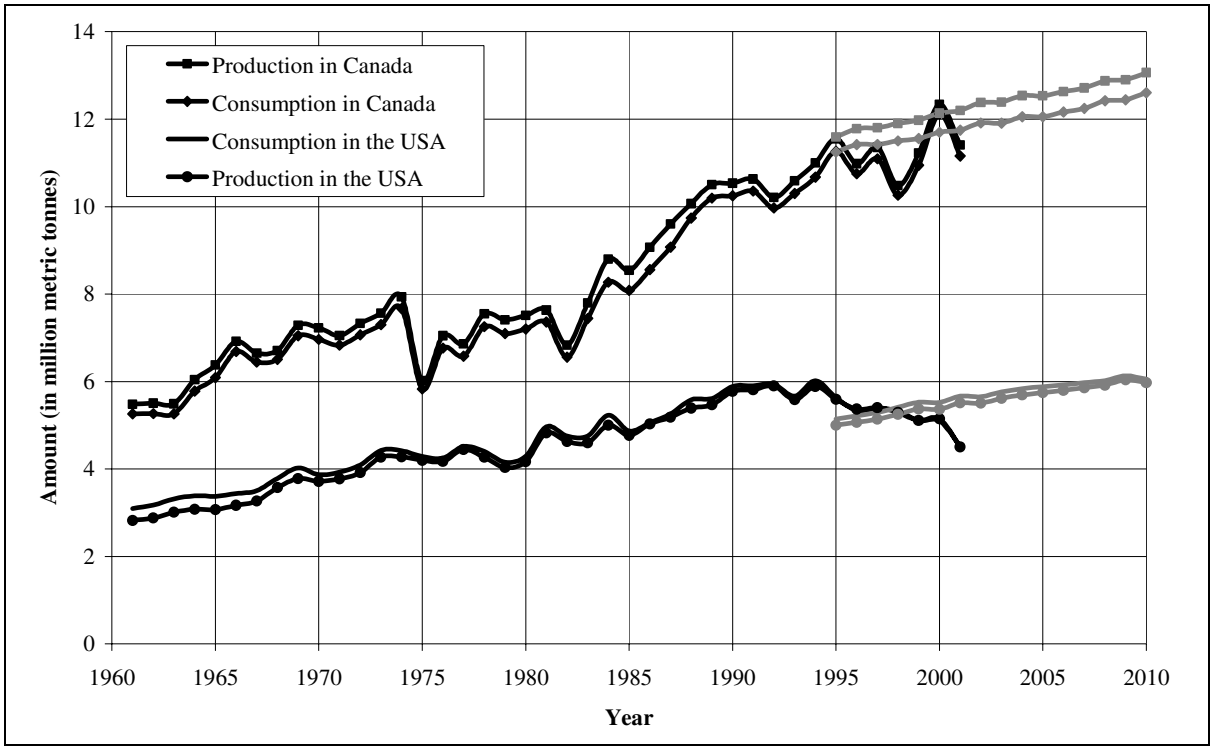
The production of wood pulp uses about 10 percent of the industrial roundwood produced in Canada and 25 percent of industrial roundwood production in the United States of America. The relative importance of this sector as a wood user has declined slightly as the production of reconstituted panels has increased. In addition, in terms of value to the forest owner, this sector is of less importance because of the generally lower prices paid for pulpwood relative to sawlogs and veneer logs.

There are also some significant differences between Canada and the United States of America in terms of the types of wood pulp produced and their contribution to the overall supply of fibre to the paper and paperboard sector. In Canada, production of total fibre furnish is currently distributed (by weight) as follows: 45 percent mechanical wood pulp; 50 percent chemical wood pulp; and five percent recovered paper. In contrast, in the United States of America, these proportions are: five percent mechanical wood pulp; 45 percent chemical wood pulp; and 50 percent recovered paper. These differences can be attributed to differences in the raw material supply (availability of coniferous and non-coniferous tree species and the amount of paper consumption that can be recovered) and to differences in the processing facilities that have developed to serve the domestic and export markets in each country.

Trends and projections of consumption and production are shown separately for each type of wood pulp in Figure 9 and Figure 10 overleaf.

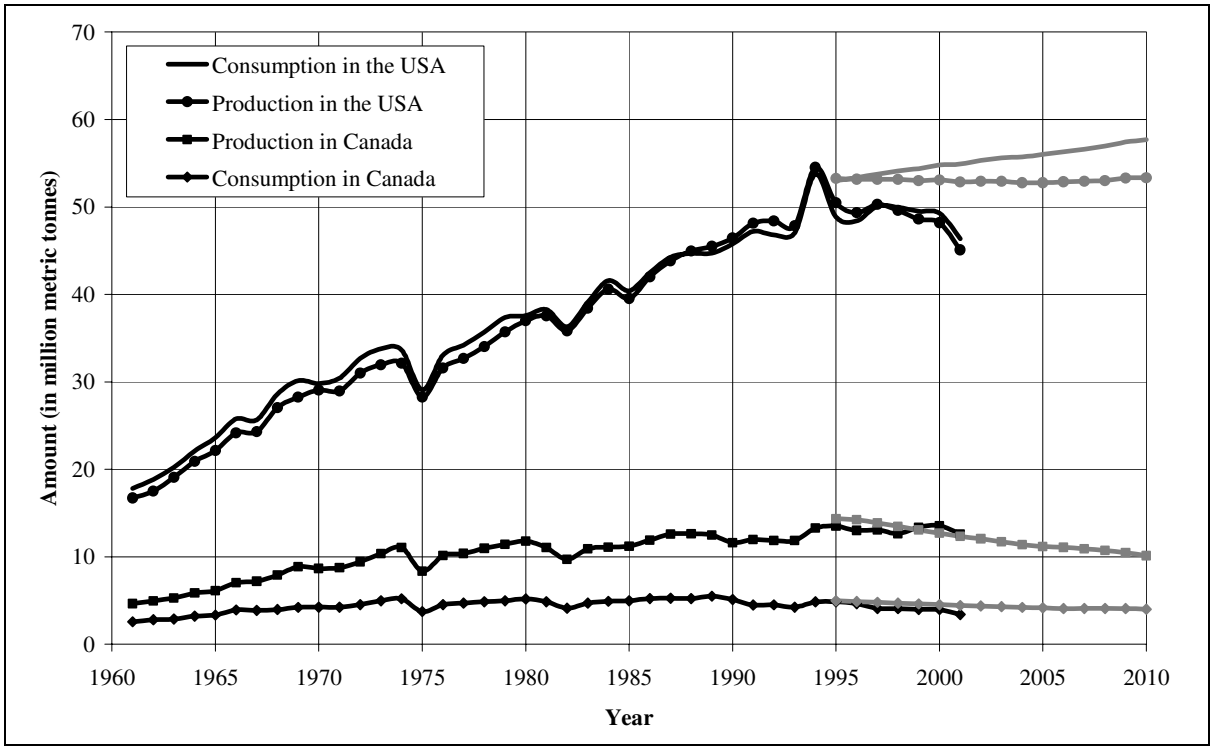
[5] Non-wood fibre pulp is not discussed in this paper because it is relatively unimportant in North America.

Figure 9 Trends and projections for the mechanical wood pulp sector in North America



Source: FAO (2003a), Zhu et al (1998).

Figure 10 Trends and projections for the chemical wood pulp sector in North America



Source: FAO (2003a), Zhu et al (1998).

Mechanical wood pulp

From the 1960s until the mid-1990s, consumption and production of mechanical wood pulp grew significantly in North America. In Canada, consumption and production doubled, from around 5.5 million metric tonnes (MT) in 1960 to just over 11 million MT in 1995 (an annual increase of around 180,000 MT). In the United States of America, consumption and production also doubled, from around 3 million MT in 1960 to 6 million MT in 1995 (growth of 80,000 MT per year). Since the mid-1990s, consumption and production have both declined significantly in the United States of America. In Canada, consumption and production have varied considerably from year to year, so it is difficult to discern any overall trend. However, it looks like the sector is continuing to expand slightly.

Consumption and production have always been roughly in balance in both countries, so international trade in this sector is relatively insignificant. Canadian exports currently account for about two percent of production and imports account for only three percent of consumption in the United States of America. In addition, each country is by far the largest trading partner with the other.

The projections for this sector show growth in consumption and production of around 1 million MT in both countries over the period 1995 - 2010. While this may be achieved in Canada, it seems very unlikely that this will now be achieved in the United States of America.

Chemical wood pulp

Historical growth in consumption and production the chemical wood pulp sector has been even more dramatic than in the mechanical wood pulp sector. In the United States of America, consumption and production have always been roughly in balance and have grown from just under 20 million MT in 1960 to around 50 million MT in 1995 (an annual increase of around 1 million MT). Imports and exports both account for just under 15 percent of production and consumption respectively. About 70 percent of imports come from Canada, but imports from Brazil have grown strongly in recent years to account for about 20 percent of imports in 2001.

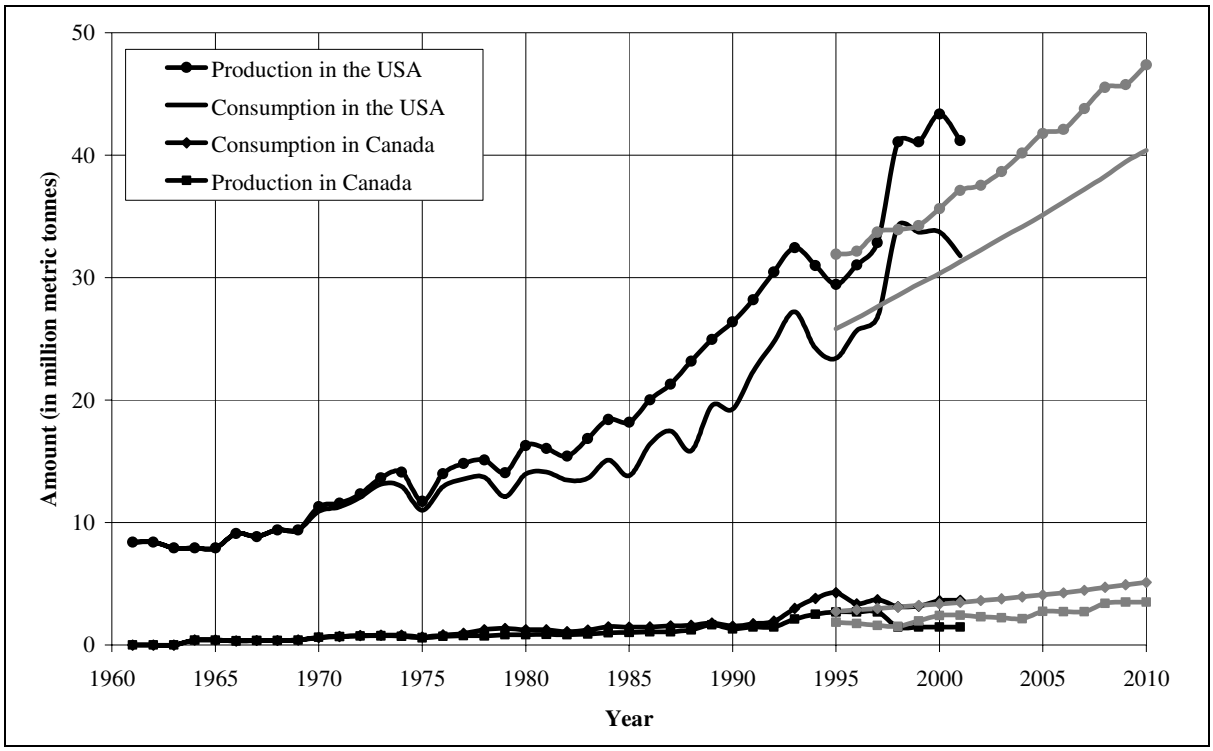
In Canada, consumption has hardly increased at all over the same period, but production has grown from around 5 million MT in 1960 to 13 million MT in 1995 (an annual increase of around 250,000 MT). Canada is also a significant net exporter of chemical wood pulp and exports about 75 percent of production (mostly to the United States of America).

Since the mid-1990s, this sector has declined somewhat. Production in Canada has remained about the same, but consumption in Canada and both consumption and production in the United States of America have declined significantly. The projections for the chemical wood pulp sector show a stable level of production in the United States of America and a slight increase in consumption of around 5 million MT over the period 1995 - 2010. For Canada, the projections show production declining significantly (about 5 million MT from 1995 to 2010) and a slight decreased in consumption. Given recent trends, it seems likely that this sector is currently declining in both countries and significantly so in the United States of America. Production in Canada may hold up if there is sufficient demand for chemical wood pulp exports, but the future looks uncertain.

Recovered paper

The recovery and use of wastepaper is another source of fibre supply for the paper and paperboard sector. The use of recovered paper is important for the forestry sector, because this competes with wood pulp and has grown in importance in recent years.

Figure 11 Trends and projections for the recovery of wastepaper in North America



Source: FAO (2003a), Zhu et al (1998).

Figure 11 shows that growth in the consumption and production of wastepaper has been particularly strong in the United States of America, especially since the 1980s. From 1980 to 2001, the recovery of wastepaper in the United States of America more than doubled from 16 million MT to 41 million MT (an annual increase of around 1.25 million MT). Consumption and production were in balance until the 1970s. Since then, consumption has fallen short of production and this gap has increased to reach about 10 million MT in 2001. Currently, the United States of America exports about one-quarter of all wastepaper collected and imports very little. These exports are shipped to numerous countries, including: Japan; China; South Korea; Thailand; Canada and Mexico.

In Canada, the recovered paper sector is much less important as a source of fibre supply. Consumption of recovered paper peaked in 1995 at about 4 million MT and has since fallen slightly. Production also peaked at around the same time, reaching a level of about 2 million MT, but has since fallen by half. Canada exports very little recovered paper and imports currently account for about 60 percent of consumption. Nearly all of these imports come from the United States of America.

The projections for the consumption and production of recovered paper show strong expected growth in both countries in North America. In the United States of America, recovery of wastepaper is projected to increase to 48 million MT by 2010, but it now seems likely that it

could increase by more than this, to at least 50 million MT. Consumption of recovered paper is projected to rise to 40 million MT, but could also rise to a higher level than this.

In Canada, consumption and production are projected to increase to 5 million MT and 4 million MT respectively. Consumption will probably increase to about this level, but the recovery of wastepaper in Canada may grow by less than projected, particularly if the oversupply situation in the United States of America continues.

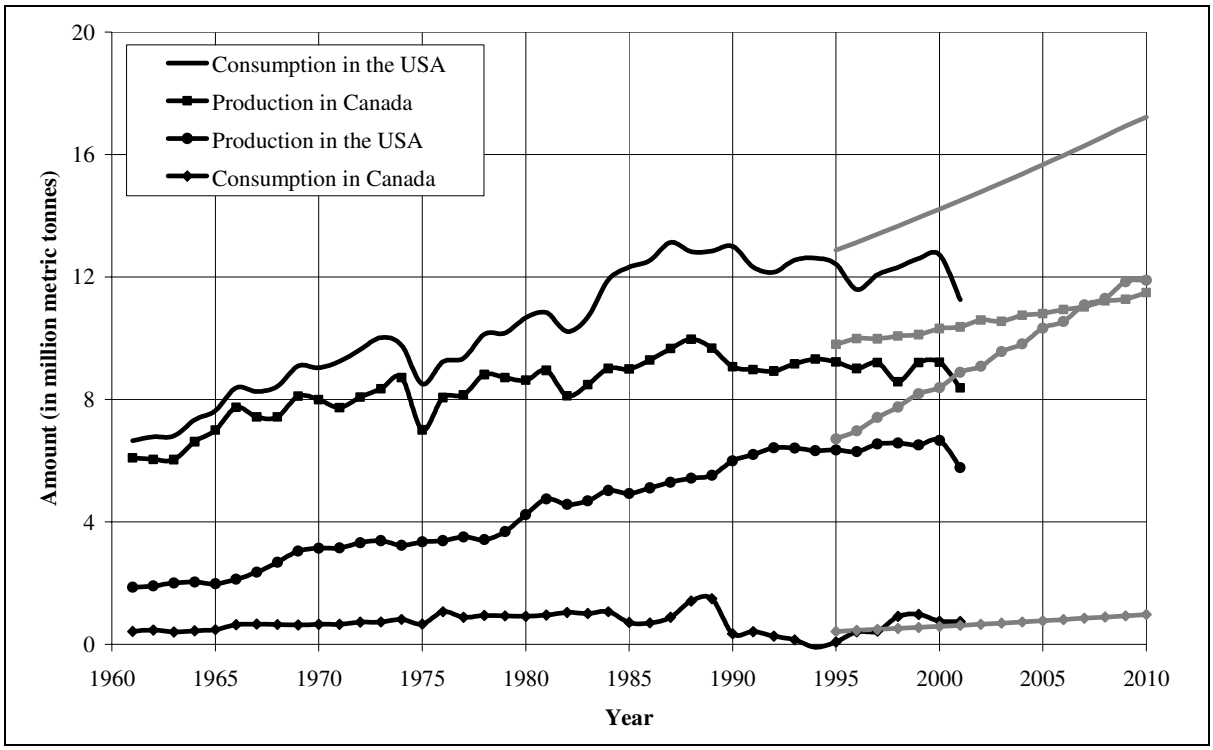
Paper and paperboard

Markets for the three main types of paper and paperboard have developed very differently over the last 40 years. Growth in the consumption and production of printing and writing paper has been dramatic, while growth in the much more mature newsprint sector has been quite modest. Furthermore, the structures of the industry and markets in Canada and the United States of America are quite different.

Newsprint

The production of newsprint is relatively more important in Canada than in the United States of America. However, in both countries, domestic consumption of newsprint is relatively small compared to the other two components of the paper and paperboard sector.

Figure 12 Trends and projections for the newsprint sector in North America



Source: FAO (2003a), Zhu et al (1998).

Figure 12 shows that growth in the consumption and production of newsprint approximately doubled from 1960 until the mid-1980s in both countries (slightly later for production in the United States of America), but has since levelled off.

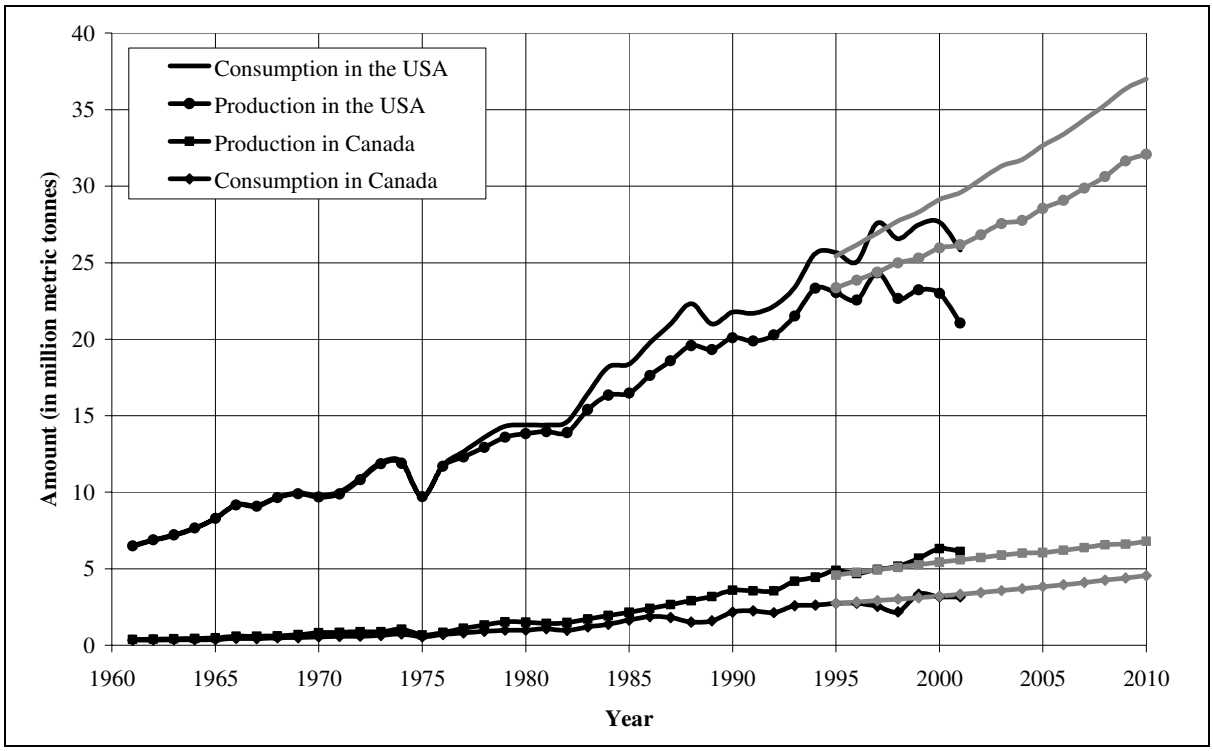
Exports of newsprint from Canada have always accounted for over 90 percent of production while, in the United States of America, imports have fallen in importance from 75 percent in the 1960s to about 55 percent currently. Most exports from Canada are to the United States of America (78 percent in 2000), where they account for almost all imports of newsprint.

The projections for consumption and production of newsprint suggest strong growth in both countries, but it seems very unlikely that this growth will materialise if current trends continue.

Printing and writing paper

As in most developed countries, growth in the consumption and production of printing and writing paper in Canada and the United States of America has been the highest by far of any processed forest product.

Figure 13 Trends and projections for the printing and writing sector in North America



Source: FAO (2003a), Zhu et al (1998).

Figure 13 shows that consumption and production of printing and writing paper has grown almost five-fold in both countries since 1961. Since the mid-1990s, growth in consumption and production in the United States of America has levelled off slightly, but growth remains strong in Canada.

The United States of America is a net importer of printing and writing paper. Net imports are quite small compared to the size of the market but are significant in absolute terms. Net exports are also significant in Canada.

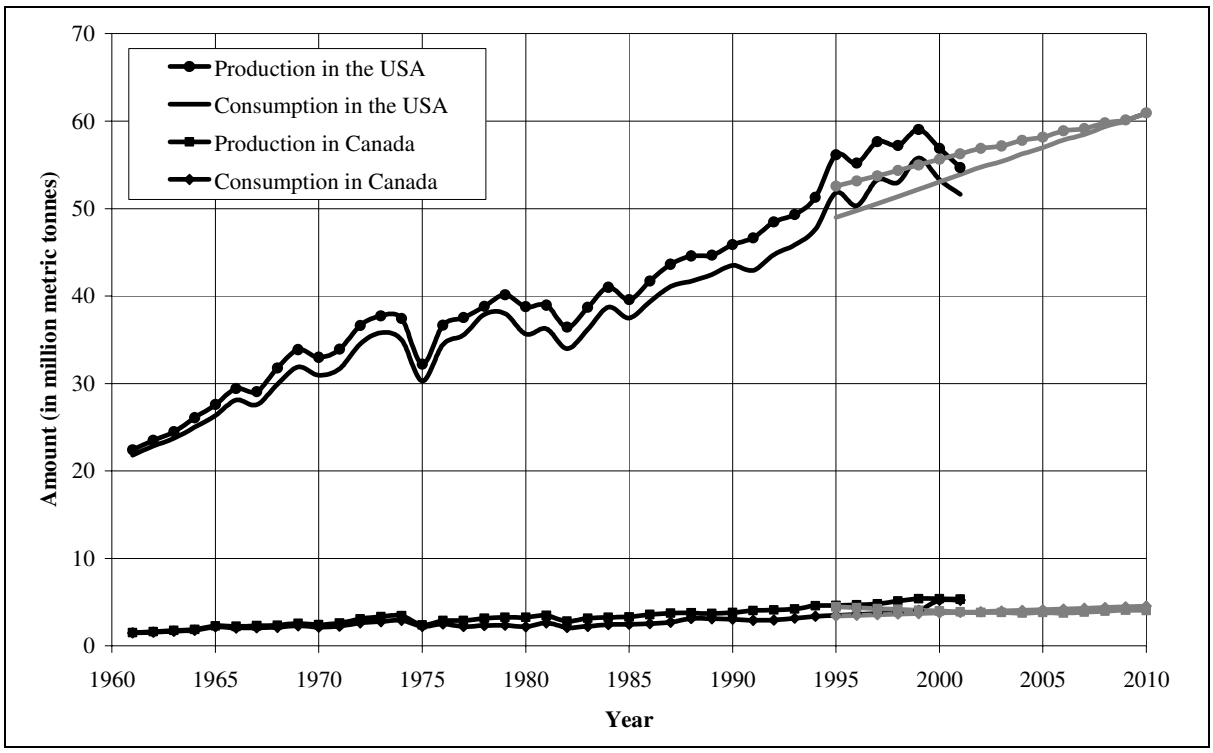
In terms of total trade, exports from Canada have increased from 15 percent of production in 1961 to just under 70 percent of production in 2001 and around 80 percent of these exports are shipped to the United States of America. Imports into the United States of America have also grown in importance, from almost nothing in the 1960s to just under 25 percent of consumption at the moment. Canada accounts for the largest share of these imports, but there are also many strong competitors in this market from Europe and the Asia-Pacific region.

The projections for printing and writing paper suggest continued strong growth in this sector. Consumption and production are both projected to grow by about 2 million MT over the period 1995 - 2010 and recent trends suggest that Canada is on target to meet these projections. In the United States of America, consumption and production are projected to grow by 12 million MT and 10 million MT respectively over the same period. Recent trends cast some doubt on these projections, but many of the fundamental drivers of this market remain strong, so there is still a reasonable prospect that markets will grow significantly in the future.

Other paper and paperboard

The other paper and paperboard sector comprises a wide range of paper products used for packaging, household applications and in industry. As with the printing and writing paper sector, the market in the United States of America is far larger than in Canada, although in this case it is approximately ten times larger in the former country than the latter. Figure 14 shows the trends and projections for consumption and production in this sector in both countries.

Figure 14 Trends and projections for other paper and paperboard in North America



Source: FAO (2003a), Zhu et al (1998).

As the figure shows, consumption and production in the United States of America have grown by about 150 percent since 1961, or just over 30 million MT. Production has grown by slightly more than consumption, so that the United States of America has become a net exporter. Net exports are significant in absolute terms, but relatively small compared to the total size of the domestic market.

In Canada, consumption and production have increased five-fold, but from a very low level of 1 million MT in 1961 to around 5 million MT at present. Consumption and production are roughly equal at the moment, but in most years over the last few decades, Canada has been a small net exporter of other paper and paperboard.

In terms of total trade, the importance of exports to both countries is more important than the figures for net trade would suggest. Canada currently exports around 3 million MT of other paper and paperboard (over 50 percent of production) and the United States of America exports around 6 million MT (over 10 percent of production). International trade in this sector is much less concentrated in cross-border trade between the two countries, although they are still the largest trading partners of each other in this sector.

The projections for other paper and paperboard indicate growth in American production of around 8 million MT over the period 1995 - 2010 and growth in consumption of around 11 million MT, closing the gap in consumption and production in the United States of America. Current evidence suggests that the American market may increase by this amount, but this is uncertain. There is also currently no evidence that the gap between consumption and production will close. For Canada, the projections suggest almost no growth in consumption and production in this sector. It looks possible that this may be an underestimate, but not by very much.

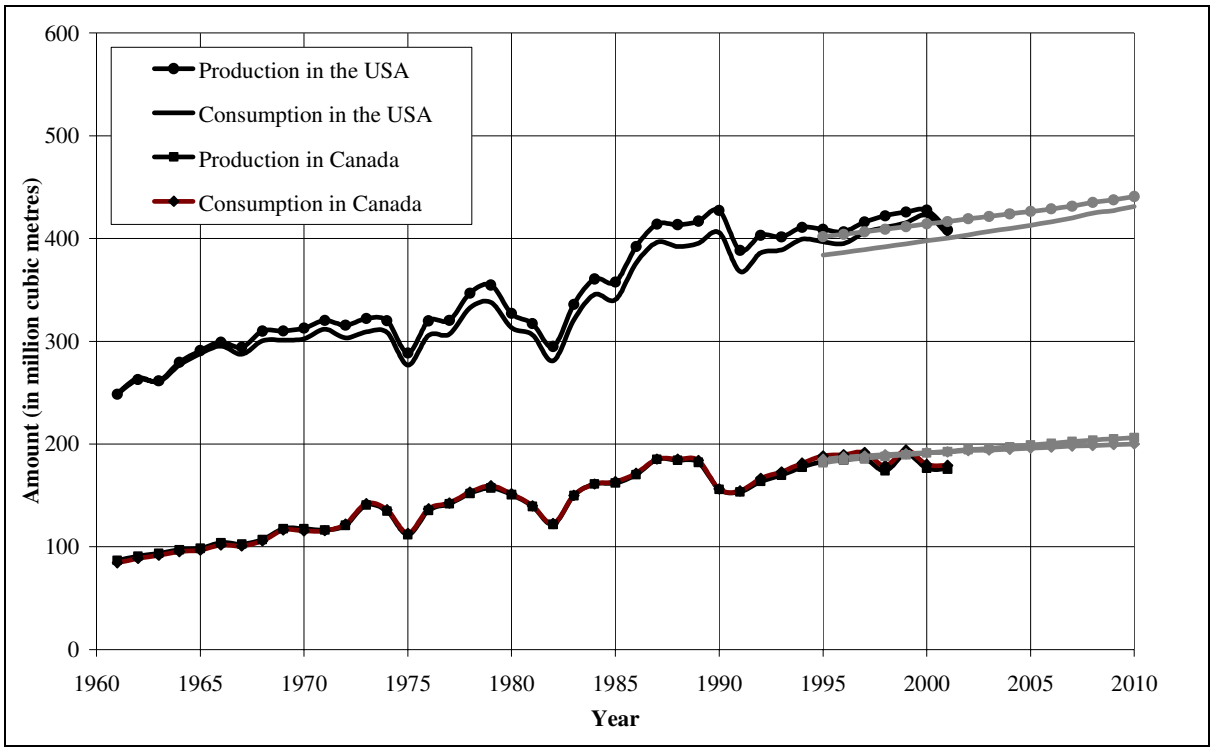
TRENDS AND PROJECTIONS FOR THE CONSUMPTION AND PRODUCTION OF INDUSTRIAL ROUNDWOOD

Trends in the consumption and production of industrial roundwood in Canada and the United States of America are shown in Figure 15. This figure shows that industrial roundwood production in both countries increased significantly until the late 1980s, reaching 410 million CUM in the United States of America and 180 million CUM in Canada. Since then, production has been relatively stable in both countries.

In terms of consumption, the consumption of industrial roundwood in the United States of America has been slightly lower than production for much of this period, leading to a small amount of net exports to other countries. However, this gap has closed in recent years. In Canada, consumption has always roughly equalled production.

Total exports of industrial roundwood in the United States of America have amounted to 10 million CUM to 20 million CUM in the past, while total exports from Canada have been around 1 million CUM to 2 million CUM. Broadly speaking, industrial roundwood trade is not significant in either country and the small amount of trade that does occur reflects specific local conditions rather than the competitiveness of the domestic forest processing sector.

Figure 15 Trends and projections for industrial roundwood in North America



Source: FAO (2003a), Zhu et al (1998).

The projections for industrial roundwood consumption and production show an expected increase in both countries of around 10 percent over the period 1995 - 2010. Total production in the United States of America may rise to about 440 million CUM by 2010 and consumption is expected to rise by slightly more to meet this level. However, much of this growth in production is expected to come from forest plantations in the south of the country.

In Canada, consumption and production are expected to remain in balance and increase by about 20 million CUM.

The projections from the GFPM do not make any distinction between species (coniferous or non-coniferous) or roundwood quality (sawlogs and veneer logs or pulpwood). However, there are some interesting differences in the trends between these different types of roundwood and these are shown in Figure 16 and Figure 17.

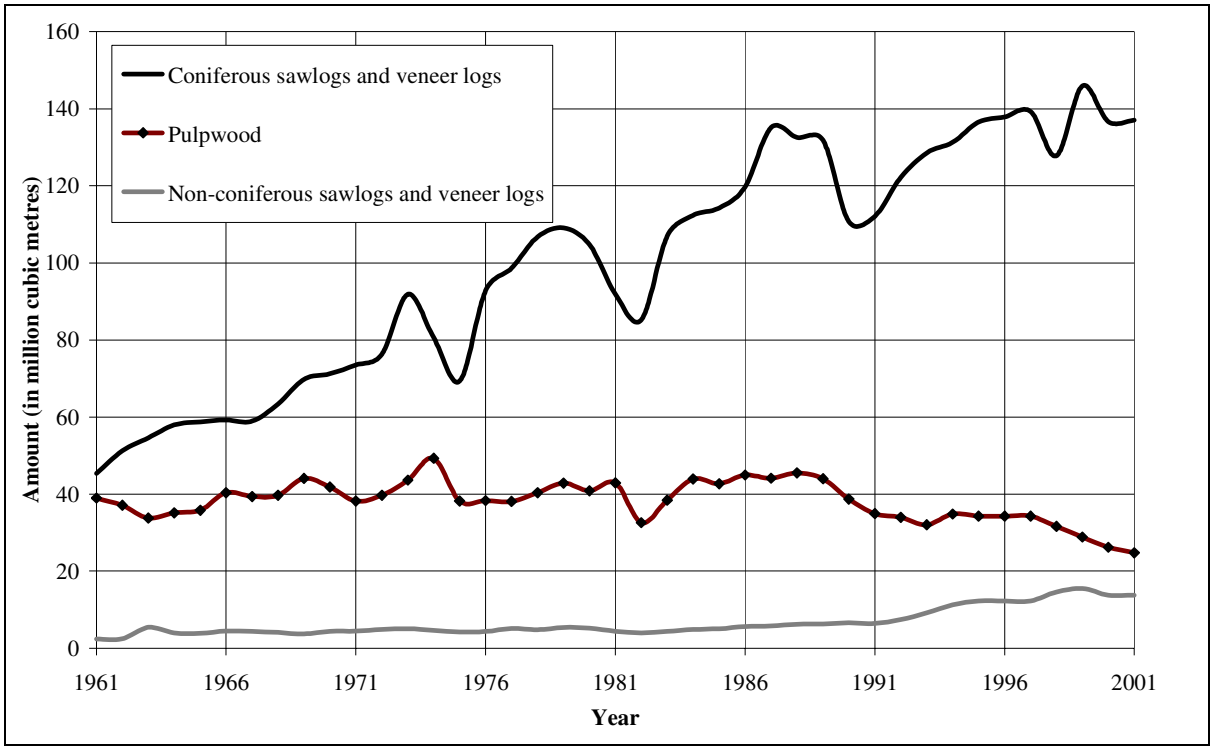
In Canada, most of the historical growth in industrial roundwood production has been growth in the production of coniferous sawlogs and veneer logs, which has increased three-fold since 1961 and now accounts for 78 percent of total production. The production of non-coniferous sawlogs and veneer logs has also increased in recent years, but only accounts for eight percent of total production.

The production of pulpwood in Canada remained stable until the late-1980s but has, since then, declined by almost half. These trends confirm the importance of the sawnwood sector as a major driving force for developments in forest management in Canada.

In the United States of America, there has been a totally different pattern of development in the past. Coniferous sawlog and veneer log production has increased very slightly from about 130 million CUM to 160 million CUM over the period, with a relatively stable production level in recent years. This component currently accounts for about 40 percent of total industrial roundwood production. Non-coniferous sawlog and veneer log production has more than doubled, from 30 million CUM to 65 million CUM, accounting for a further 16 percent of total production.

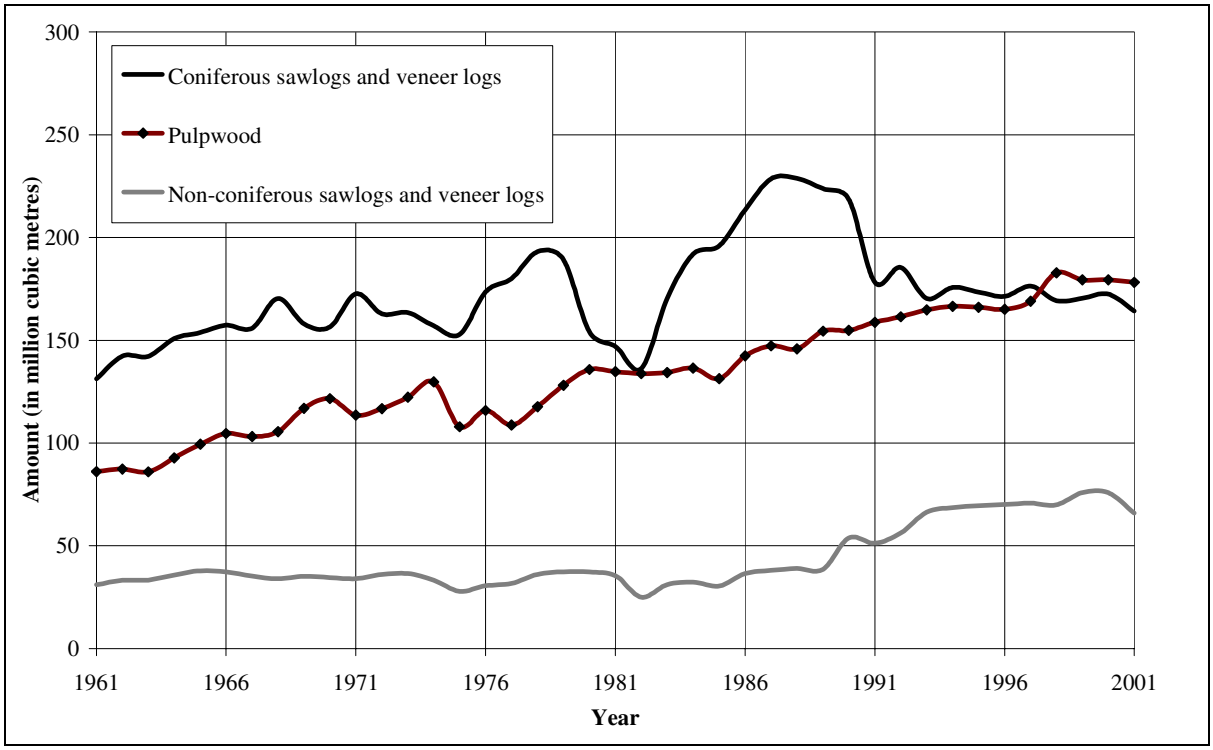
However, the most interesting feature in the United States of America has been the rapid growth in pulpwood production, which has also doubled in the past, from 85 million CUM to 180 million CUM. The production of pulpwood in the United States of America has recently surpassed the production of coniferous sawlogs and veneer logs, to account for 44 percent of total production. Furthermore, while the production of coniferous sawlogs and veneer logs appears to have levelled off recently, production of the other two types of roundwood appears to be continuing to grow strongly.

Figure 16 Trends in industrial roundwood production in Canada



Source: FAO (2003a).

Figure 17 Trends in industrial roundwood production in the United States of America



Source: FAO (2003a).

SUMMARY OF THE MARKET TRENDS AND PROJECTIONS AND IMPLICATIONS FOR FUTURE DEVELOPMENTS IN THE FORESTRY SECTOR

A summary of all of the recent trends for each of the major forest product categories examined earlier is presented in Table 1 and a synthesis of some of the most important implications of this analysis is given below.

Market structure

The production of forest products in North America is primarily focused on markets in the United States of America and this is particularly likely to be the case for the Great Lakes forest area. Consumption in the United States of America is mostly satisfied by domestic production and imports from Canada, but other countries outside North America have increased their presence in some market sectors, such as: fibreboard; chemical pulp; printing and writing paper; and other paper and paperboard. Imports into the relatively small Canadian market are quite small and, where they do occur, they tend to come from the United States of America and occur as a result of specific advantages in terms of location.

However, although the North American market is currently quite well insulated from the effects of globalisation, this will not necessarily remain the case in the future. A large proportion of American consumers live on the coast and it can be expected that these markets will attract competition from other suppliers as their forestry sectors develop in the future.

Based on the volume and value of roundwood used in each of the different forest products sectors in North America, the relative importance of the each of the different sectors is probably as follows: coniferous sawnwood (most important); other paper and paperboard; printing and writing paper; non-coniferous sawnwood; plywood and veneer sheets; reconstituted panels (particleboard and fibreboard); and newsprint. However, there are large differences in the importance of the different sectors in different regions. For example, in Ontario, the three most important forest product sectors in 1998 (in terms of export value) were coniferous sawnwood, followed by other paper and paperboard and then newsprint (CFS, 1998).[6] In addition, in the south of the Great Lakes forest area, non-coniferous sawnwood production is also relatively important.

[6] However, it is also interesting to note that the importance of coniferous sawnwood had declined drastically by 2002 (CFS, 2002), reflecting the variability in this sector and recent market developments.

Table 1 Recent trends in production, consumption and trade of processed forest products in North America and their importance as a roundwood user

Country and product category	Approximate importance as a roundwood user	Recent (since mid-1990s) trends in consumption and production	Importance of international trade and main trading partner(s) in 2001
Canada			
Sawnwood	80%	Consumption: significant decline Production: significant decline	Net trade: significant net exports Total exports: 76% of production Partner(s): 85% to USA
Plywood and veneer sheets	5%	Consumption: slight decline Production: slight increase	Net trade: significant net exports Total exports: 66% of production Partner(s): 80% to USA
Particleboard	5%	Consumption: significant increase Production: huge increase	Net trade: significant net exports Total exports: 79% of production Partner(s): 95%+ to USA
Fibreboard		Consumption: stable Production: huge increase	Net trade: significant net exports Total exports: 99% of production Partner(s): 90% to USA
Mechanical pulp	10%	Consumption: slight increase Production: slight increase	Net trade: roughly in balance Total exports: 2% of production Partner(s): 70%+ to USA
Chemical pulp		Consumption: slight decline Production: stable	Net trade: significant net exports Total exports: 75% of production Partner(s): 70%+ to USA
Recovered paper	n.a.	Consumption: slight decline Production: huge decline	Net trade: significant net imports Total imports: 60% of consumption Partner(s): 90%+ from USA
Newsprint	n.a.	Consumption: slight increase Production: stable	Net trade: significant net exports Total exports: 92% of production Partner(s): 78% to USA
Printing and writing paper	n.a.	Consumption: slight increase Production: significant increase	Net trade: significant net exports Total exports: 67% of production Partner(s): 80%+ to USA
Other paper and paperboard	n.a.	Consumption: stable Production: stable	Net trade: small net exports Total exports: 52% of production Partner(s): 80%+ to USA
United States of America			
Sawnwood	50%	Consumption: significant decline Production: significant decline	Net trade: significant net imports Total imports: 30% of consumption Partner(s): 95% from Canada
Plywood and veneer sheets	10%	Consumption: slight increase Production: slight decline	Net trade: small net imports Total imports: 16% of consumption Partner(s): various
Particleboard	15%	Consumption: huge increase Production: huge increase	Net trade: significant net imports Total imports: 32% of consumption Partner(s): 80% from Canada
Fibreboard		Consumption: huge increase Production: slight increase	Net trade: significant net imports Total imports: 30% of consumption Partner(s): 50% Germany; 40% Canada
Mechanical pulp	25%	Consumption: significant decline Production: significant decline	Net trade: roughly in balance Total imports: 3% of consumption Partner(s): 90% from Canada
Chemical pulp		Consumption: significant decline Production: significant decline	Net trade: roughly in balance Total imports: 13% of consumption Partner(s): 70% Canada; 20% Brazil
Recovered paper	n.a.	Consumption: huge increase Production: huge increase	Net trade: significant net exports Total exports: 23% of production Partner(s): various
Newsprint	n.a.	Consumption: stable Production: stable	Net trade: significant net imports Total imports: 55% of consumption Partner(s): 97% from Canada
Printing and writing paper	n.a.	Consumption: stable Production: stable	Net trade: significant net imports Total imports: 24% of consumption Partner(s): 50%+ from Canada
Other paper and paperboard	n.a.	Consumption: slight increase Production: slight increase	Net trade: significant net exports Total exports: 11% of consumption Partner(s): Canada; Mexico; various

Market trends and projections

Solid wood products

Total consumption of all solid wood products in North America has grown consistently over the last four decades, doubling from 100 million CUM in 1961 to just under 200 million CUM in 2001. It is expected that growth in this sector will slow down slightly to an increase of about 2 million CUM per year, reaching about 215 million CUM in 2010.

However, behind this broad trend, it is expected that much of this growth will come in the reconstituted panels sector. Consumption of plywood and veneer sheets may continue at current levels, but the consumption of sawnwood is unlikely to increase in the future and may continue to decline as reconstituted panels are substituted for this product.

Production of solid wood products has always slightly exceeded consumption in North America and this is expected to continue in the future. Growth in total solid wood product production may amount to about 3 million CUM per year, to reach a level of 245 million CUM by 2010. The structure of growth is expected to follow that of consumption, with greater growth in the reconstituted panels sector than in the sawnwood and plywood and veneer sheets sectors.

Sawnwood will continue to be the main product exported outside the region, while fibreboard appears to be the only product where competitors from outside the region have taken a significant share of the market.

Fibre furnish

Total consumption of fibre furnish in North America has also grown consistently over the last four decades, from 40 million MT in 1961 to over 100 million MT in 2001. It is expected that consumption growth in this sector will continue at an increase of about 2 million MT per year, reaching about 125 million MT in 2010.

North America has always produced more fibre furnish than it consumes and this is expected to continue in the future. However, this gap between production and consumption is expected to close due to slightly declining or, at best, flat production levels in Canada. It is expected that growth in production in this sector will increase by less than in the past at a rate of about 1 million MT per year, reaching about 130 million MT in 2010.

One of the possible reasons for the expected decline in production growth is that international trade in fibre furnish with countries outside the region is quite important. Only around 70 percent of Canadian exports go to the United States of America and Canada accounts for less than 80 percent of American imports. In particular, Brazil has recently taken a significant share of chemical wood pulp imports into the United Stats of America. Canada will continue to be a significant (but possibly declining) exporter of wood pulp and it is expected that the United States of America will continue to export significant amounts of wastepaper.

Paper and paperboard

Not unexpectedly, total consumption of paper and paperboard in North America has grown by the same amount as fibre furnish, from 40 million MT in 1961 to over 100 million MT in 2001 and it is expected that consumption growth in this sector will continue at an increase of about 2 million MT per year, reaching about 125 million MT in 2010. Little growth is expected in the newsprint sector. Printing and writing paper is the second largest component of total paper and paperboard consumption and has in the past experienced the highest rates of growth. However, the expected strong growth in this sector looks uncertain. Fortunately, other paper and paperboard, which is by far the most important sector, looks set to meet or even exceed the consumption projection.

Historically, North American production of paper and paperboard has always exceeded consumption, but lower growth in production is expected in the future, so that the gap between production and consumption is expected to close by 2010.

Again, international trade with countries outside the region is quite important for this sector. Exports of other paper and paperboard from both countries are shipped to a variety of countries outside the region. In the other two sectors, Canada exports a significant proportion of production outside the region and the United States of America only meets around 50 percent of its printing and writing paper import requirements from Canada.

Implications and outlook for forest product prices

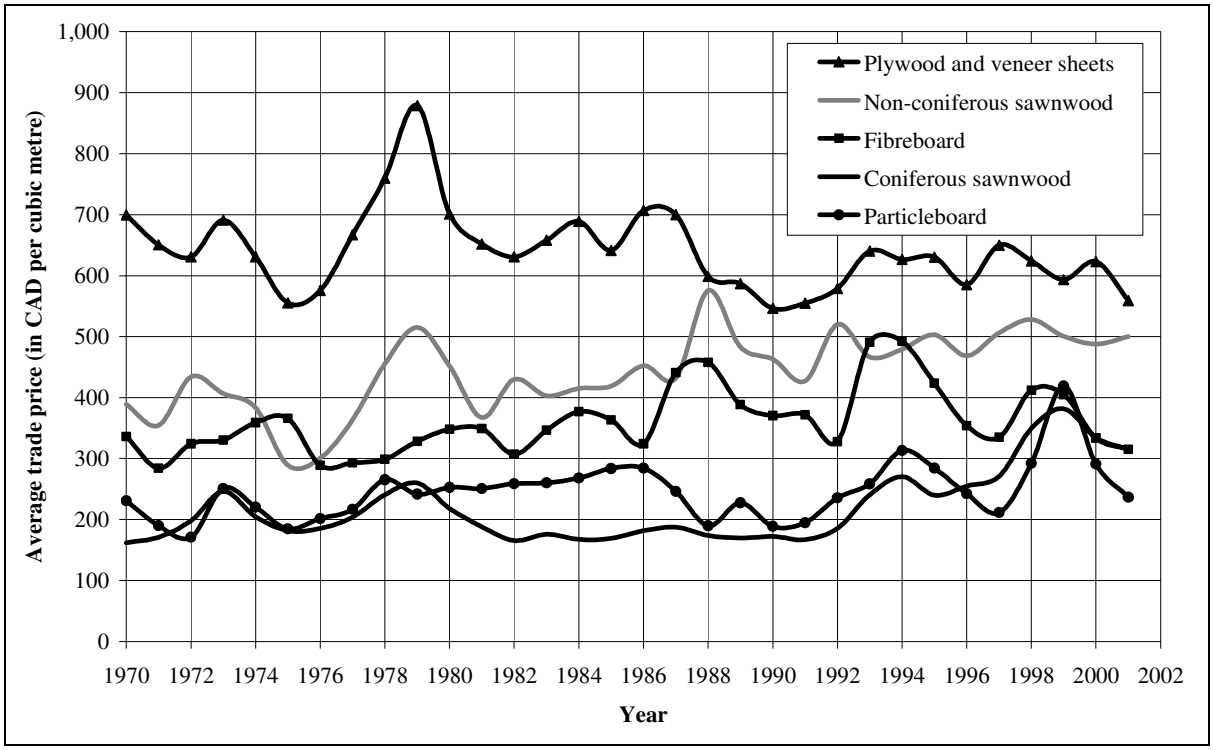
Recent trends in forest products prices are shown in Figure 18 to Figure 21 overleaf. For the purpose of this analysis, international trade prices[7] rather than domestic prices have been used. These have been adjusted for inflation (i.e. converted to 2001 price levels), using the GDP deflators for Canada and the United States of America.

The first point noting is that the United States Dollar (USD) has appreciated against the Canadian Dollar (CAD) over the period (e.g. a 35 percent increased in the value of the USD relative to the CAD over the last 10 years). Consequently, prices in local currency in Canada have been stable or even increasing in some cases, while prices in the United States of America have generally been declining.

Because it is not possible to accurately forecast what is likely to happen to exchange rates in the future, the rest of this analysis will examine the prospects for forest products prices in the United States of America. If the assumption is made that a gradual appreciation of the USD against the CAD will continue in the future, then the prospects for future price developments in Canada are somewhat better than suggested below.

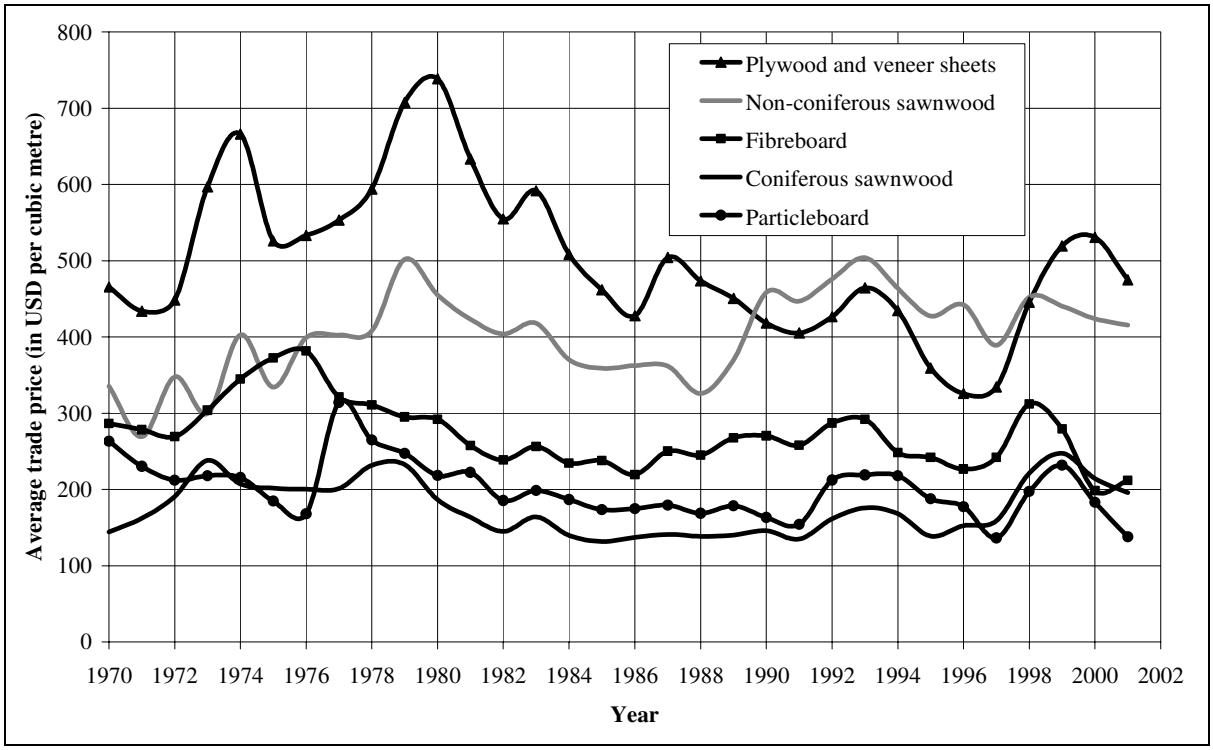
[7] These have been calculated by adding together the total value of imports and exports and dividing this by total volume of imports and exports. The source used for this analysis was the trade statistics reported in the FAOSTAT forest products database.

Figure 18 Trends in real prices for solid wood products in Canada



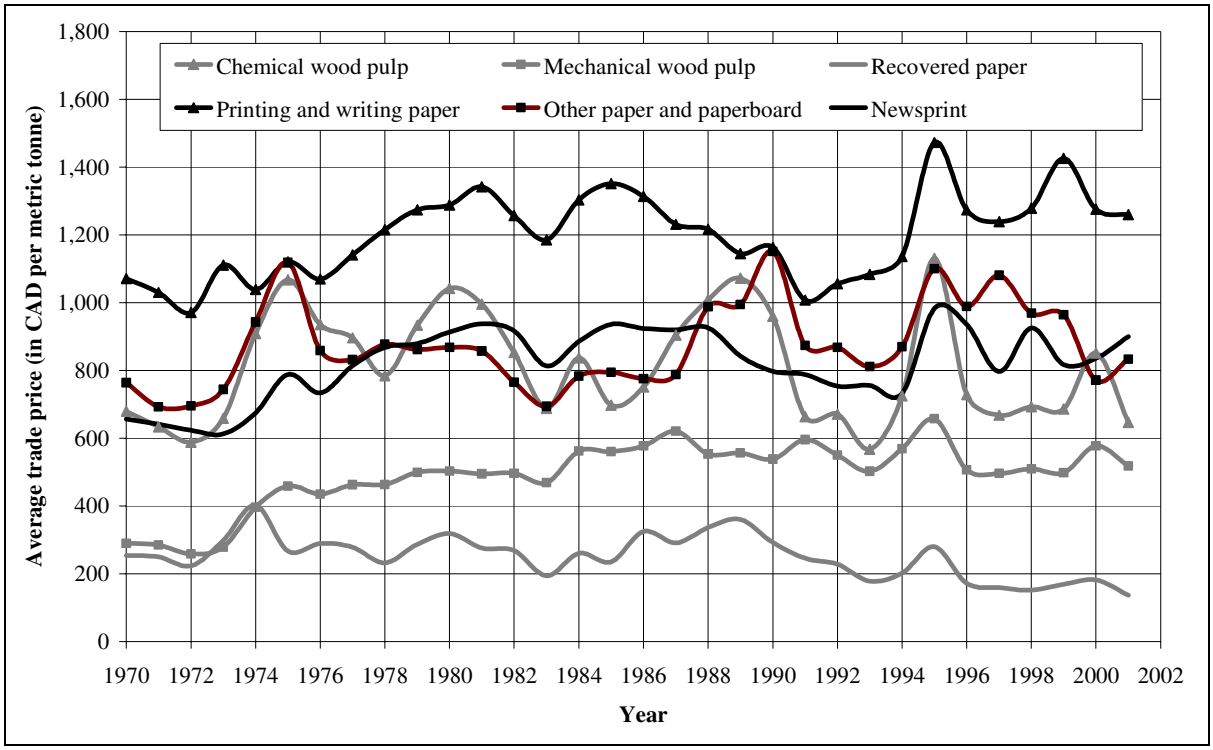
Source: FAO (2003a). Note, all prices have been converted to 2002 price levels using the Canadian GDP deflator.

Figure 19 Trends in real prices for solid wood products in the United States of America



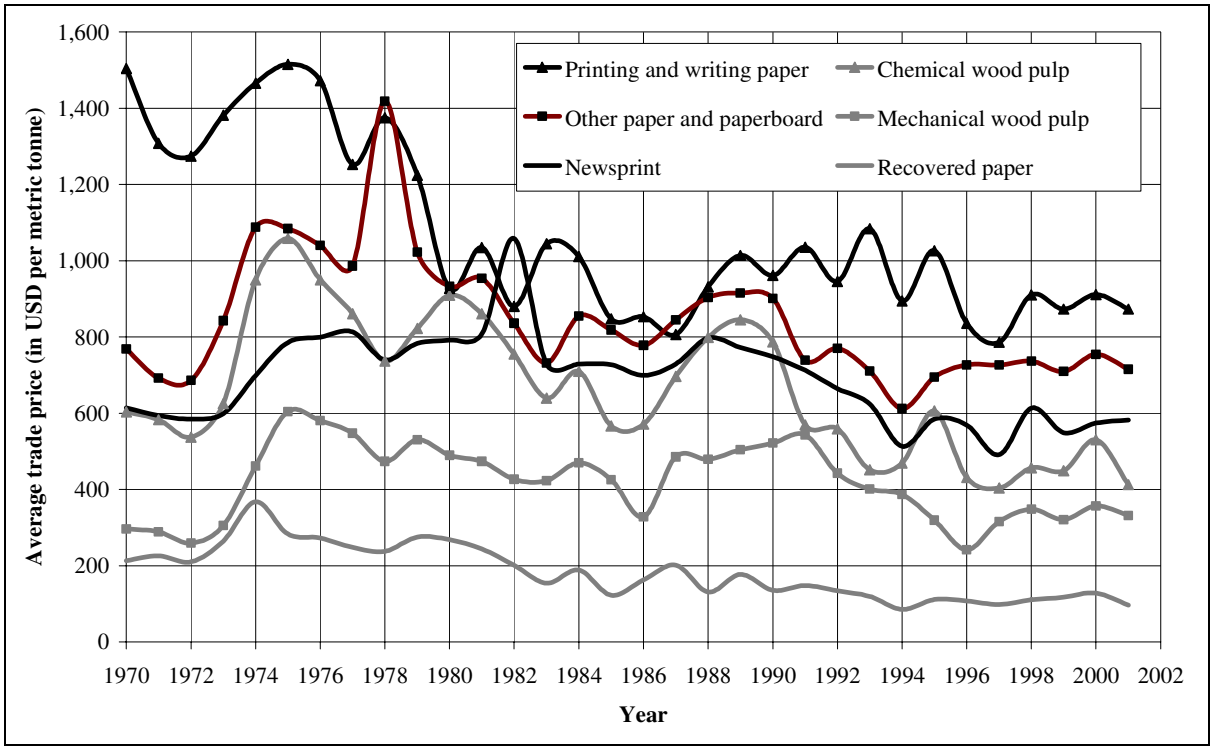
Source: FAO (2003a). Note, all prices have been converted to 2002 price levels using the American GDP deflator.

Figure 20 Trends in real prices for pulp and paper in Canada



Source: FAO (2003a). Note, all prices have been converted to 2002 price levels using the Canadian GDP deflator.

Figure 21 Trends in real prices for pulp and paper in the United States of America



Source: FAO (2003a). Note, all prices have been converted to 2002 price levels using the American GDP deflator.

Solid wood products

Although prices for some solid wood products have declined in the last few years, examination of the long-terms trends suggests that this is largely due to cyclical variation and that many solid wood products are still trading within the broad range of prices paid in the past.

For most of the 1980s and 1990s, **coniferous sawnwood** traded at a real price of around USD 140 to USD 160 per cubic metre. Prices in the last few years rose above this range but they appear to be on the way back down again. Given the projected developments in North American supply and demand, an expectation of more global competition in the future and the current price trends, sawnwood prices are likely to decline in the future, falling to the bottom of this range.

For **non-coniferous sawnwood**, the prospects are brighter. Non-coniferous sawnwood prices throughout the 1980s fell in the range USD 350 to USD 450 per cubic metre. In the 1990s, the price range increased (in real terms) to USD 400 to USD 500 per cubic metre. There is relatively stable demand for non-coniferous sawnwood in domestic and export markets and consumers will pay for quality in this market, so it is expected that prices may increase from current levels, but will still tend to stay in the range of USD 400 to USD 500 per cubic metre overall.

Prices for **plywood and veneer sheets** are generally the highest out of all of the solid wood products, but they have declined in real terms in the past. Since the mid-1980s, they have traded mostly in the range of USD 400 to USD 500 per cubic metre. It is expected that they will return to the bottom of this range in the future, due to pressure from competing products.

Particleboard prices have also fallen (in real terms) in the long-term and have traded in the range of USD 150 to USD 200 per cubic metre since the 1980s. Although prices are currently depressed, the outlook is for balanced supply and demand in North America, so prices are expected to return to this range in the future.

Fibreboard prices have fallen consistently in the range of USD 200 to USD 300 per cubic metre since the 1980s. Prices for this product are also currently depressed at the moment. The outlook is for consumption to continue to outpace production in North America, so there may be some scope for price improvements. However, with oversupply in Europe at the moment and probably in the future, prices are only expected to return to the bottom of this range.

Fibre furnish

In general, real prices for all three types of fibre furnish have declined since the mid-1970s. Since 1990, **mechanical wood pulp** has traded in the range of USD 400 to USD 500 per metric tonne, **chemical wood pulp** has traded in the range of USD 300 to USD 400 per metric tonne and **recovered paper** has traded at around USD 100 per metric tonne. With the projected continuation of excess supply of recovered paper in the United States of America, it is expected that recovered paper utilisation will continue to hold prices within or at the bottom of these ranges.

Paper and paperboard

In general, paper and paperboard prices have also declined in real terms over the long-run.

For **newsprint**, prices over much of the 1970s and 1980s fell in the range of USD 600 to USD 800 per metric tonne. Since then, newsprint has traded in the range of USD 500 to USD 600 per metric tonne. There is little prospect of price improvements in this sector, due to the generally stable outlook for production and consumption.

In the **printing and writing paper** sector, prices have fallen dramatically and have traded in the range of USD 800 to USD 1,000 per metric tonne since the 1990s. Currently, prices are in the middle of this range. The uncertainty about future growth in this sector, combined with continued strong foreign competition, suggests that prices will remain at around USD 900 per metric tonne or may decline slightly.

The price of **other paper and paperboard** has varied considerably in the past, with little indication of any strong trend one way or the other. Other paper and paperboard has traded in the range of USD 600 to USD 800 per metric tonne in the 1990s and it is likely to continue to do so in the future. However, there remains considerable uncertainty about prices in this sector due to the fact that both Canada and the United States of America are significant net (and total) exporters of this product and face stiff competition in global markets.

Implications for industrial roundwood production and prices

In view of the above analysis, it seems likely that there will continue to be some growth in demand for industrial roundwood, but the nature of that growth is likely to change.

Demand for high-quality sawlogs and veneer logs is likely to decline, with the consequence that prices are expected to soften. In contrast, demand for pulpwood should strengthen as the production of reconstituted panels and wood pulp continues to expand. However, there are many other sources of lower quality fibre available to meet these needs (e.g. sawmill residues and recovered paper). Furthermore, these processed products are traded in a more international and competitive environment. Given these two factors, it seems likely that pulpwood prices will not increase in the near future.

GLOBAL TRENDS IN FOREST PRODUCTS MARKETS

Although the forestry sector in Canada and the United States of America benefits from the substantial market in the United States of America, the sector is not immune to some of the major trends sweeping across all forest products markets in the World. Some of these trends are described here, along with their implications for the forestry sector in Canada and the United States of America.

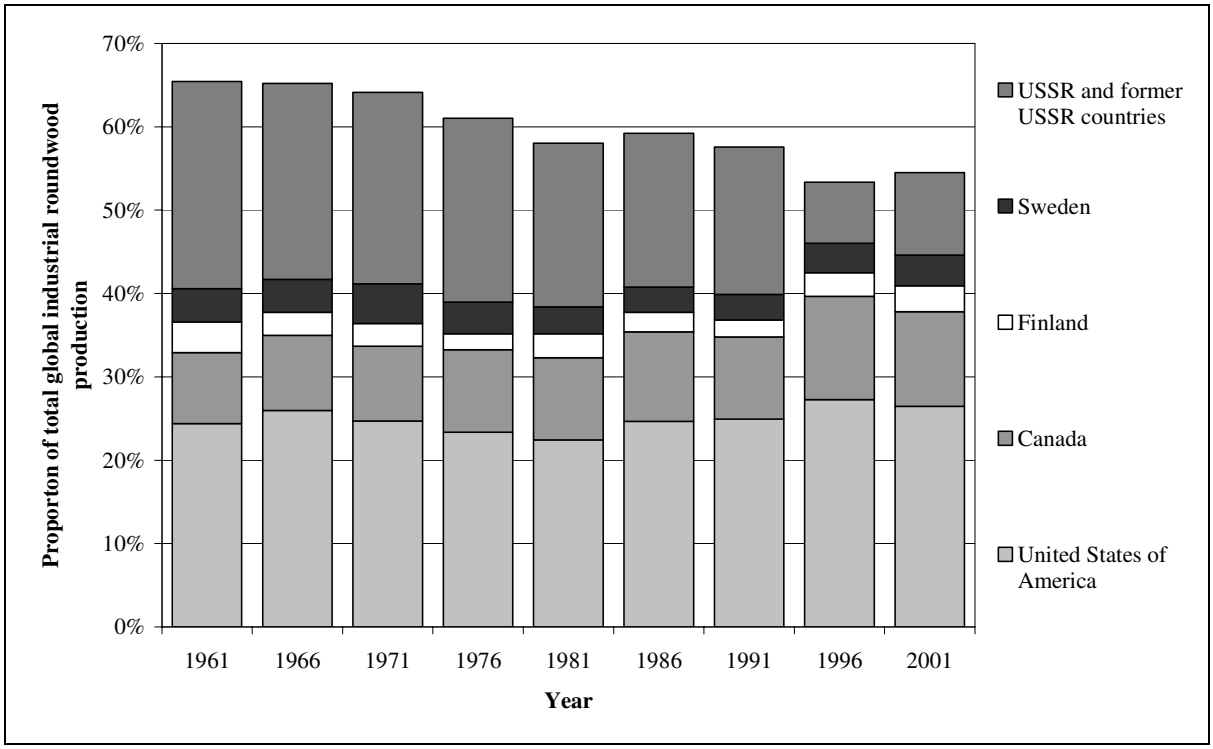
Changes in regional importance: the rise of the Southern Hemisphere

Over most of the last century, global production of industrial roundwood and forest products was concentrated in the Northern Hemisphere. In particular, most forest products were supplied by five main countries: Canada; the United States of America; Finland; Sweden; and the USSR. Outside these countries, production was dispersed amongst a large number of smaller producers, which focused manly on meeting domestic needs or traded in relatively small amounts with neighbouring countries. These big five producers dominated global forest products markets and led the world in terms of technology and product development.

However, over the last four decades, the importance of this group as a whole has declined. While the global production of industrial roundwood has increased by about 50 percent from 1.0 billon CUM in 1961 to 1.5 billion CUM in 2001, the share of global production held by these five countries has declined from about 65 percent to 55 percent over the same period (see Figure 22). The American share of the global total has held up at around 25 percent and Canada's share has increased slightly from nine percent to eleven percent, but the share of total production in the other big three producers has declined, in particular in the countries of the former USSR.

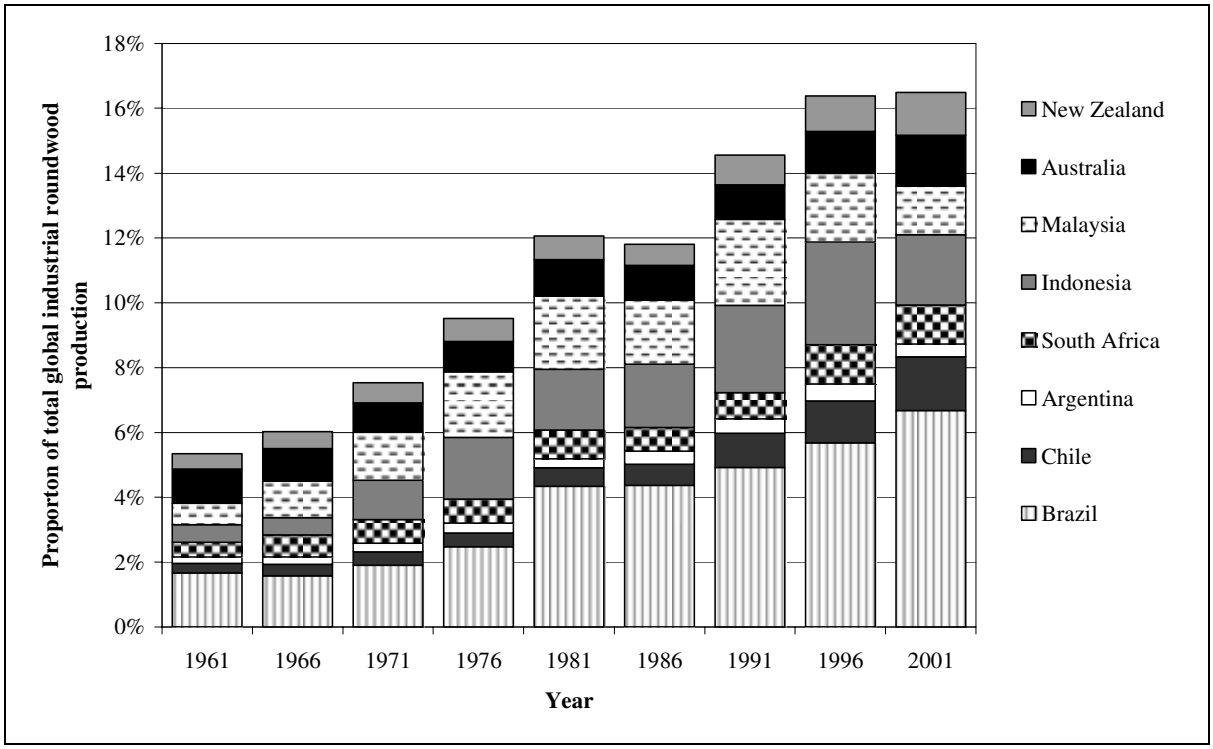
Set against this trend, the main source of competition in global forest products markets has become more concentrated into a few countries in the Southern Hemisphere. Three South American countries (Brazil, Chile and Argentina), South Africa, Malaysia and Indonesia, and Australia and New Zealand, have all developed dynamic forestry sectors, where growth in industrial roundwood production and the production of a wide range of processed forest products have developed at a rapid rate over the last four decades. Together, these eight countries have increased their share of total global industrial roundwood production from around five percent in 1961 to 16 percent in 2001, almost exactly offsetting the decline in the market share held by the five large producers in the north (see Figure 23).

Figure 22 Trends in the proportion of global industrial roundwood production in the United States of America, Canada, Finland, Sweden and the former USSR



Source: FAO (2003a).

Figure 23 Trends in the proportion of global industrial roundwood production in the main producer countries in the Southern Hemisphere



Source: FAO (2003a).

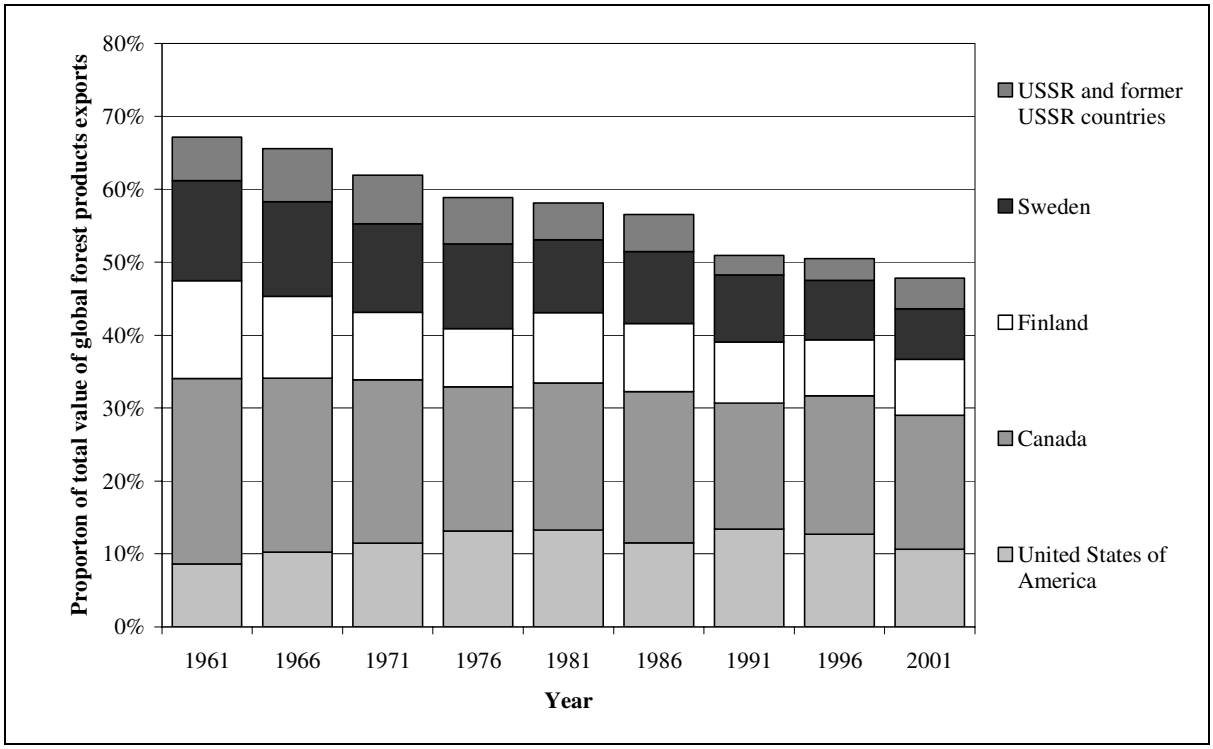
These developments in regional supply would seem to indicate that there has been a subtle shift in the comparative advantage between the large producers in the north and the new producers in the south. This shift is described very clearly in Brown (2000). Traditionally, success in the forestry sector used to depend largely on having an abundant supply of trees. However, what these trends imply is that success now depends more on having the natural conditions where trees grow fast and the right "*enabling environment*" to allow the forestry sector to prosper.

This last point must be emphasised and can be explained by taking southern Africa as an example. Many countries in southern Africa have ideal conditions for fast tree growth, plus the advantage of low land prices and cheap labour costs. However, only South Africa has had the stable policy environment and the complete range of supporting services that have allowed the forestry sector there to prosper and develop into a major global supplier of forest products.

Another point worth noting is that these southern producers have specifically orientated the development of their forestry sectors for export growth as part of their overall national development strategies. For example, Figure 24 and Figure 25 compare the share of the total value of global forest products exports accounted for by the big five producers in the north and the new producers in the south.

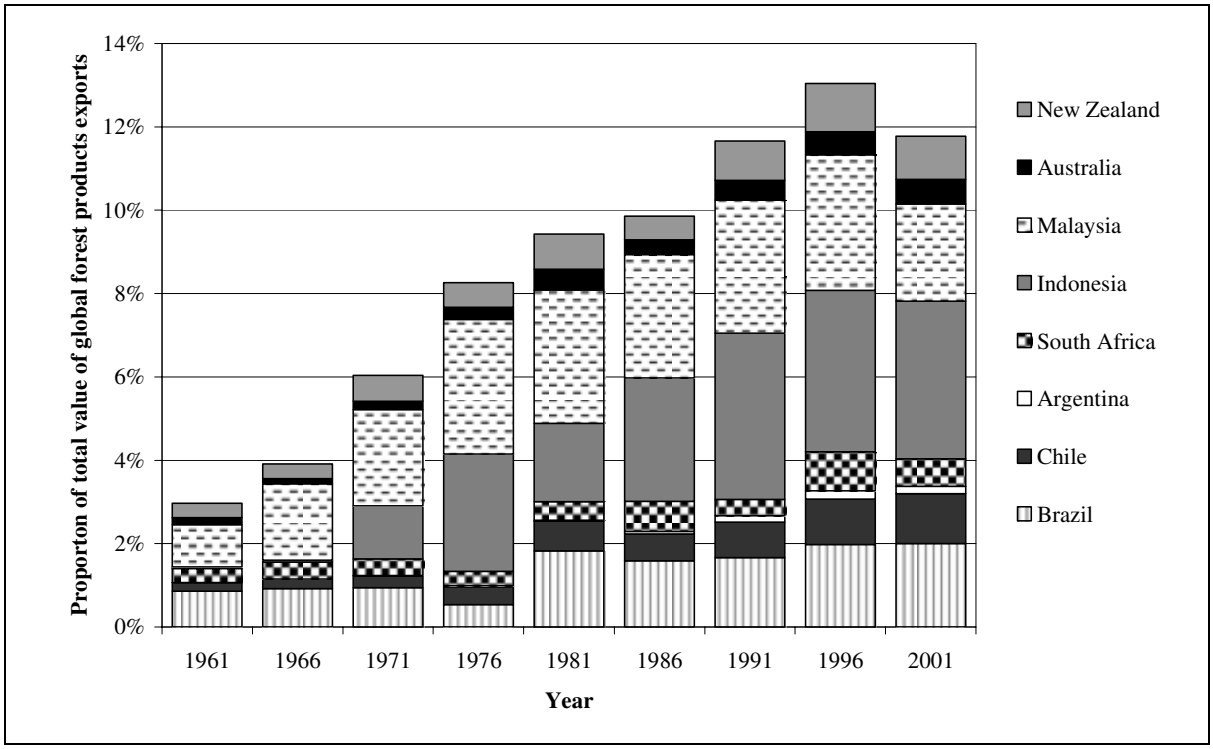
Figure 24 shows that the total share of global forest products exports coming from the big five producers in the north has declined from a little over 65 percent in 1961 to under 50 percent in 2001. The share held by the United States of America has increased very slightly, but the share held by the other four countries has declined significantly. In particular, Canada's share of global forest products exports has declined from about 25 percent to 20 percent of the total over the last four decades. Furthermore, exports from Canada have become increasingly focused on the American market and the importance of Canadian exports to other markets, particularly in Europe, has declined by even more than this.

Figure 24 Trends in the proportion of global forest products exports coming from the United States of America, Canada, Finland, Sweden and the former USSR



Source: FAO (2003a).

Figure 25 Trends in the proportion of global forest products exports coming from the main producer countries in the Southern Hemisphere



Source: FAO (2003a).

Changes in forest management and utilisation: the race to the bottom of the market?

Changes have also probably taken place in the types of forest that are now being used for industrial roundwood production and the forest management regimes that are being applied around the world. Although it is difficult to identify clear trends in this respect from the historical statistics on industrial roundwood production, it is possible to make some broad observations about what has been happening.

Changes in wood quality: pulpwood versus sawlogs and veneer logs

Traditionally, most of the production of pulpwood in the temperate and boreal forest comes from thinnings and the tops of logs when trees are finally harvested. There are probably four main underlying factors that can alter the relative shares of sawlog and veneer log production against pulpwood production in these forests and they are as follows:

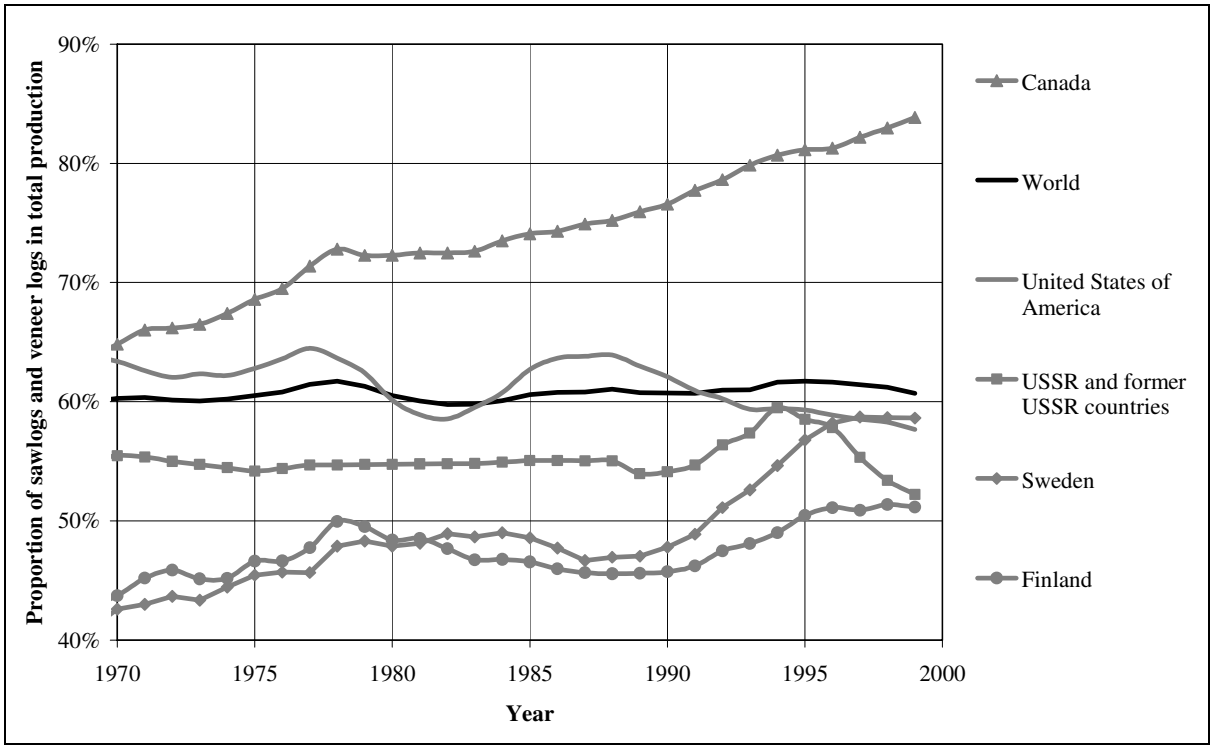
- changes in intensity of management, with more management leading to more thinnings and higher pulpwood volumes;
- the transition in harvesting from primary to secondary forests, where harvesting in second and subsequent cutting cycles generally leads to the production of smaller-sized trees and more pulpwood;
- changes in the duration of cutting cycles, with shorter cutting cycles leading to smaller-sized trees at harvesting and more pulpwood production; and
- changes in product grading, sorting and technology, with improvements in all of these areas leading to increased production of sawlogs and veneer logs from a resource base of a given quality.

Figure 26 shows trends in the proportion of sawlog and veneer log production (out of total industrial roundwood production) in the five big northern forest producers. As this figure shows, the proportion of sawlogs and veneer logs in total production has increased in Canada, Finland and Sweden, but has stayed about the same in the United States of America and the countries of the former USSR. It is also worth noting that Canada has the greatest orientation towards sawlog and veneer log production of almost any country in the World.

The increase in the sawlog and veneer log share in Canada, Finland and Sweden is probably due to improvements in product grading, sorting and technology. In particular, the size of industrial roundwood that can be used in sawmilling and, to a lesser extent, plywood manufacturing, has reduced in many developed countries due to the introduction of better processing technology. These improvements have outweighed any effects from the other three factors listed above, which would all tend to have the opposite effect.

Processing technology has also improved in the United States of America, but the overall share of sawlogs and veneer logs has not increased there, due to the increased production of pulpwood from fast growing forest plantations in the south of the country. In the countries of the former USSR, the share has not increased, probably due to the generally low levels of technology used in the processing industry there.

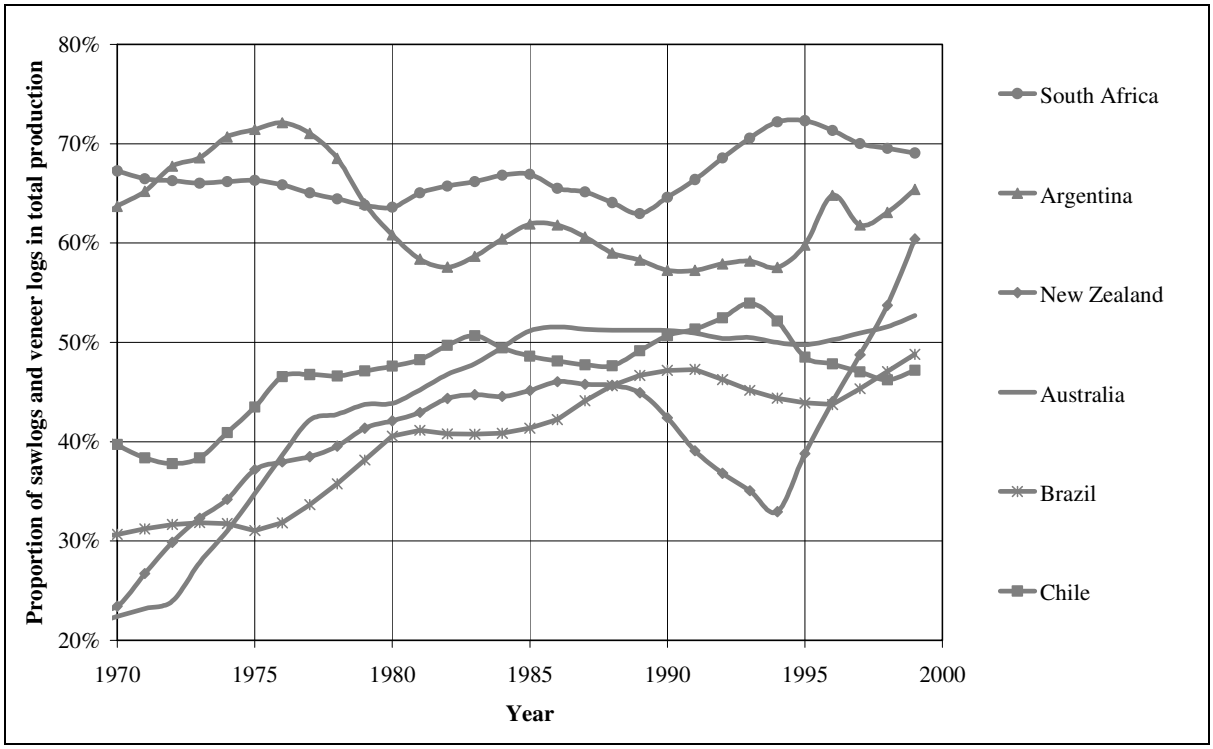
Figure 26 Trends in the share of sawlogs and veneer logs in total production in the United States of America, Canada, Finland, Sweden and the former USSR



Source: FAO (2003a). Note, the figures presented above are five-year moving average.

Figure 26 also shows that the average share of sawlog and veneer log production throughout the World has remained roughly constant at about 60 percent of all production. Because the proportion of sawlog and veneer log production has increased in the five biggest producers, this implies that the share of sawlog and veneer log production in the rest of the World must have declined and this is indeed the case.

Figure 27 Trends in the share of pulpwood in total production in the in some of the main producer countries in the Southern Hemisphere



Source: FAO (2003a). Note, the figures presented above are five-year moving averages.

Figure 27 shows the trends in the share of pulpwood production in some of the main producers in the Southern Hemisphere. Apart from South Africa and Argentina, where pulpwood has always accounted for about 60 percent to 70 percent of total industrial roundwood production, this figure shows that pulpwood production has become much more important in these countries.

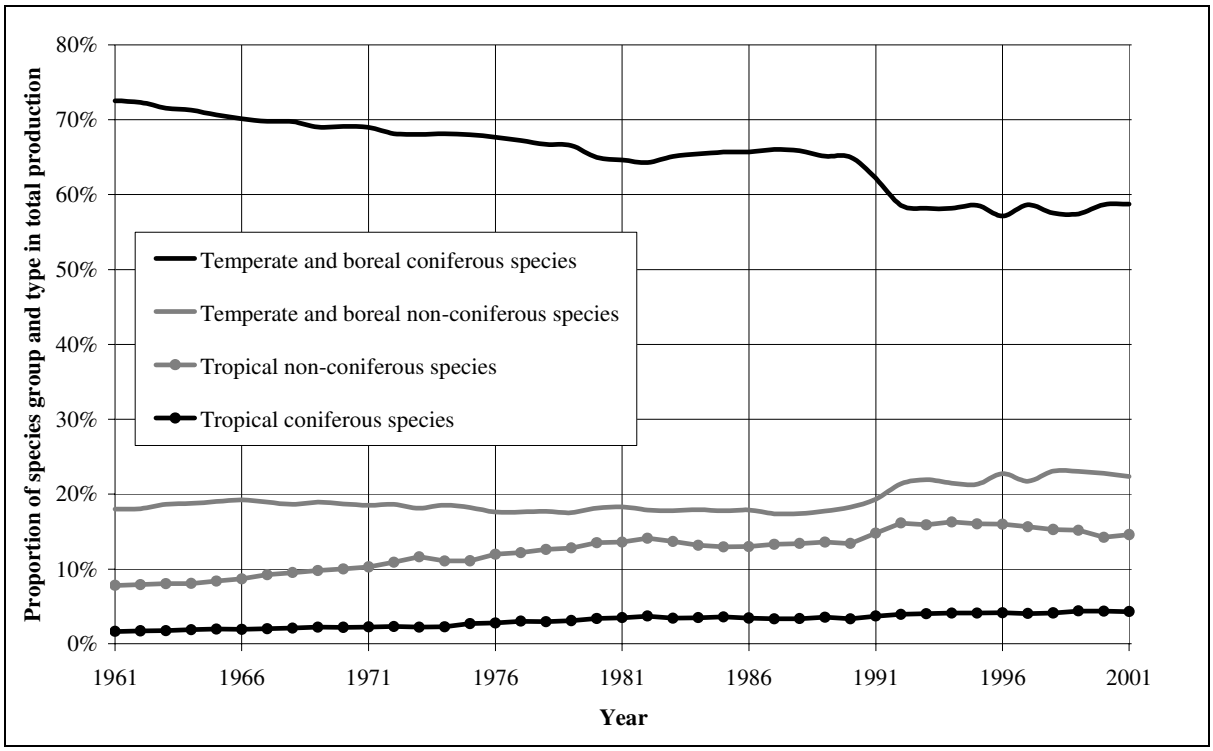
These trends have occurred for two reasons. Firstly, a number of these countries (as well as other countries not shown here) have started to grow trees specifically for pulpwood production. This model of forest production is closer to the agricultural model of production than traditional forest management and has taken off particularly in the tropics and sub-tropics where trees grow very fast.

The second force behind these trends is that most of these countries tend to manage forests very intensively on relatively short rotations, which results in a lot of thinnings and a high proportion of pulpwood in the final harvest. It is not possible to identify a trend towards shorter rotations in other regions of the World from the forest production statistics, but there is anecdotal evidence that cutting cycles or rotation ages have become much shorter in recent years in many countries (e.g. the United Kingdom; Sweden; Finland; and the United States of America).

Changes in species use: conifers versus non-conifers

Another global trend in the utilisation of forest resources has been the increased use of non-coniferous tree species over the last four decades.

Figure 28 Trends in the production of coniferous and non-coniferous industrial roundwood from tropical and temperate and boreal regions of the World



Source: FAO (2003a).

Figure 28 shows the proportion of global industrial roundwood produced since 1961 from the tropical zone and the temperate and boreal zone, divided into coniferous and non-coniferous industrial roundwood production. This shows that the importance of coniferous industrial roundwood production from the temperate and boreal zone has declined by about 15 percent in terms of its contribution to global industrial roundwood production.

On the supply side, economic growth in developing countries has undoubtedly supported the growth in non-coniferous industrial roundwood production from the tropical zone. However, it should also be noted that the contribution of non-coniferous industrial roundwood production in the temperate and boreal zone has increased by about five percentage points over the last four decades.

Changes in technology have encouraged the use of a lot of non-coniferous industrial roundwood which, until recently, would have been considered as non-commercial by the forest processing sector. This probably accounts for some of the sudden increase in non-coniferous industrial roundwood production in the temperate and boreal zone in the early-1990s. In addition, on the demand side, some of this wood has properties that are more desirable than coniferous species in some of the fastest growing forest products markets, such as printing and writing paper (FAO, in prep).

The importance of non-coniferous industrial roundwood production from the tropical zone has declined somewhat in recent years due to environmental concerns that have led to a decline in the markets for tropical solid wood products. However, in the future, it is expected that non-coniferous pulpwood from the tropical zone will become increasingly more important.

Changes in resource type: the rising importance of forest plantations

Many of the changes described in the earlier part of this section can be attributed to one major factor and that is the growing importance of forest plantations for future global wood supplies. In 2000, FAO produced a detailed analysis of the outlook for forest plantations (Brown, 2000) and a summary of this is presented below.

Status of the forest plantation resource in 1995

Forest plantations account for only a very small proportion of the global forest area. In 1995, it was estimated that the global area of forest plantations was about 125 million hectares, or approximately 3.5 percent of the global forest area. A handful of countries account for the majority of the total forest plantation area, including: China; the Russian Federation; the United States of America; India; and Japan. These countries have each established more than 10 million hectares of forest plantations and together they account for 65 percent of the global forest plantation resource.

Tropical and sub-tropical forest plantations account for 45 percent of the global resource and non-coniferous species occupy 55 percent of the tropical forest plantation area. These plantations are dominated by two genera: Eucalyptus and Pine. Forest plantations in temperate and boreal countries account for 55 percent of the global forest plantation resource and the most important species there are spruce, pine and fir.

It was estimated that the global area of industrial forest plantations in 1995 was around 100 million hectares. The most notable feature of this resource is the preponderance of forest plantations in Asia and the very high proportion of forest plantations of less than 15 years old (in 1995), particularly in developing countries.

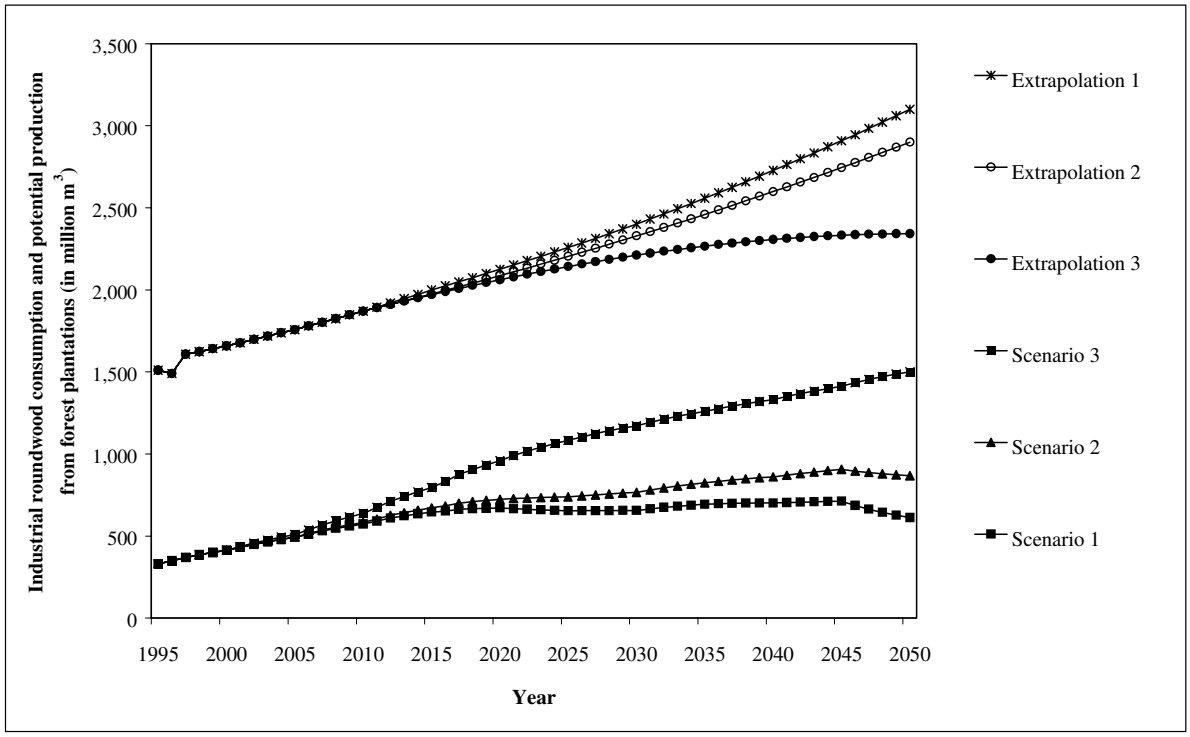
Annual rates of forest plantation establishment in temperate and boreal countries could not be accurately estimated. However, in tropical and sub-tropical countries, it was estimated that the forest plantation resource was increasing by slightly more than 4 million hectares per annum.

Production from forest plantations was estimated to account for around 12 percent of total global roundwood production in 1995. Industrial forest plantations accounted for about 22 percent of global industrial roundwood production (330 million CUM), compared with a contribution of only four percent to global wood fuel production from non-industrial forest plantations.

The outlook for forest plantation areas and industrial roundwood production

Quantitative modelling of the future potential roundwood production from forest plantations showed that, regardless of future rates of afforestation, production will increase substantially. Under a medium growth scenario, which assumed that annual afforestation would be equal to around one percent of current forest plantation areas, global potential industrial roundwood production from forest plantations was estimated to reach a maximum of about 900 million CUM in 2045. A low growth scenario, assuming no new afforestation, resulted in a projection of only a modest increase in potential roundwood production. A high growth scenario, assuming a gradual reduction from current afforestation rates, resulted in the global area of forest plantations increasing to 235 million hectares by 2050 and potential industrial roundwood production of around 1.5 billion CUM by 2050 (see Figure 29).

Figure 29 Projections of future potential industrial roundwood supply from forest plantations compared with total industrial roundwood production



Source: Brown (2000).

A qualitative assessment of the scenarios suggested that the medium scenario (Scenario 2) was most likely to be broadly representative of the future. For example, land scarcity could physically constrain forest plantation development in some countries to a level below that modelled in the high scenario (Scenario 3). On the other hand, current trends in forest plantation establishment suggested that some new forest plantations will be planted in the future, making the low growth scenario (Scenario 1) equally unlikely.

Expected contribution to future industrial roundwood supplies

The projection of total global industrial roundwood production (produced by the GFPM) only extends to 2010. However, many of the more interesting aspects of the plantation projections appear after this year. Therefore, in order to put the forest plantation projection into context, three simple extrapolations of total industrial roundwood production were produced (see: Brown, 2000, for further details).

Until 2010, potential industrial roundwood production from forest plantations increases by about the same amount (in terms of volume) as projected total production. This occurs whatever scenario or extrapolation is chosen. It implies that existing forest plantations have the potential to meet the projected increase in demand for industrial roundwood (at a broad level) in the near-term. However, this increase is unlikely to be sufficient enough to substitute (in aggregate) for production from the natural forest in any significant way.

Beyond 2010, the contribution that industrial forest plantations will make is dependent on the extent to which the demand for industrial roundwood continues to increase and on future levels of forest plantation expansion.

If future industrial roundwood consumption continues to grow at a high rate (i.e. as in the first two extrapolations) then potential industrial roundwood production from forest plantations would only keep up with the growth in consumption if large additional areas of forest plantations were established (i.e. as in under scenario 3). The other two forest plantation scenarios would fail to keep pace with the growth in consumption (i.e. they would increase their share of total production, but the volume of industrial roundwood required from other sources would also have to increase).

However, if future industrial roundwood consumption grows less rapidly, for example at a rate similar to Extrapolation 3, then industrial forest plantations are likely to play a much greater role in future industrial roundwood production. Under Extrapolation 3, Scenario 1 would result in forest plantations having the potential to meet 30 percent of industrial roundwood demand in 2050. This is slightly higher than at present, but not a major improvement over the current situation. Furthermore, it would also require production from other sources to increase in the future, because the growth in potential production (in terms of volume) would not be sufficient to meet the total growth in consumption.

Under Scenario 2, forest plantations could meet 37 percent of industrial roundwood demand by 2050. This would be a significantly higher percentage than at present and would also mean that production from forest plantations could keep up with increases in consumption (in terms of volume).

The combination of Extrapolation 3 and Scenario 3 gives the most dramatic results of all. If growth in consumption is relatively modest (i.e. like Extrapolation 3), but forest plantation expansion is high (Scenario 3), the projected potential industrial roundwood production from industrial forest plantations (1.5 billion cubic metres in 2050) could account for 64 percent of total consumption by 2050. This would represent both a three-fold increase in the share of total consumption that might come from industrial forest plantations and an increase (in terms of volume) that is sufficient to reduce significantly the need to obtain industrial roundwood supplies from elsewhere.

Table 2 shows the share of projected total global industrial roundwood production that might come from forest plantations in the future under all of the combinations of the three extrapolations and scenarios. Given that the rate of growth in global industrial roundwood production has declined in the past and that Scenario 2 seems most likely for future forest plantation development, it looks as though forest plantations will probably account for about 30 percent of future global industrial roundwood production in the near-term, rising to 37 percent of production in the long-term. It also implies that, in the long-term, there is little need to expand industrial roundwood production from other sources.

Table 2 Projected potential industrial roundwood production from forest plantations as a percentage of total industrial roundwood production

Forest plantation scenario	Current estimate (1995)	Alternative extrapolations of production growth								
		Extrapolation 1			Extrapolation 2			Extrapolation 3		
		2010	2020	2050	2010	2020	2050	2010	2020	2050
Scenario 1	22.2	30.6	31.5	19.7	30.6	32.1	21.1	30.6	32.5	29.6
Scenario 2	22.2	31.2	34.1	28.0	31.2	34.7	29.9	**31.2**	**35.1**	**37.0**
Scenario 3	22.2	34.1	45.1	48.4	34.1	45.9	51.7	34.1	46.5	64.0

Source: Brown (2000).

Availability of wood supply from all forest areas: potential supply versus actual supply

As already noted, the GFSM projects the potential (rather than actual) roundwood production from forests. When the projections from the GFSM are used as an input to the GFPM, the GFPM projections of actual production (derived from the forest product consumption projections) indicate that actual production should be below potential production in most tropical countries for the foreseeable future (i.e. the projected actual production levels should not run into any constraints such as scientifically determined estimates of the sustainable level of harvesting). However, the GFSM does not cover the countries of the temperate and boreal region.

Another simpler way to examine this issue is to compare industrial roundwood production with the net annual increment (NAI) of forests available for wood supply. There is insufficient data about the forest resource at the global level to produce a model showing the effect that future roundwood production might have on the future condition of the forest resource. However, it is possible to compare current production with the current NAI of forests available for wood supply from the latest FAO Forest Resource Assessment (UN, 2000). Such a comparison has been made for coniferous industrial roundwood production in Canada, the United States of America and the major coniferous industrial roundwood producers in Europe and this is shown in Table 3 overleaf.

Table 3 Comparison between current coniferous industrial roundwood production and the status of the forest resource in Canada, the United States of America and major European producer countries

Country	Coniferous industrial roundwood production in 2001 (in million m^3 UB)	NAI of coniferous forest available for wood supply (in million m^3 OB)	Production as a proportion of NAI	Proportion of coniferous forest available for wood supply over 40 years old
Canada	145.8	158.3	92%	c.70%
USA	270.4	386.0	70%	c.45%
Russian Federation	89.9	464.0	19%	82%
Sweden	53.6	71.5	75%	48%
Finland	41.7	56.6	74%	65%
Germany	27.1	63.5	43%	n.a.
France	23.6	39.5	60%	43%
Poland	17.4	33.1	53%	55%
Czech Republic	12.0	17.1	70%	64%
Austria	9.7	21.9	44%	55%
Spain	8.3	16.7	50%	n.a.
Latvia	7.7	6.4	120%	64%
Norway	7.6	17.5	44%	60%
United Kingdom	6.9	12.7	55%	19%
Estonia	5.7	4.1	140%	66%
Portugal	5.0	7.9	63%	93%

Source: production data: FAO (2003a); forest resource data: UN (2000).

As Table 3 shows, the majority of countries are currently harvesting much less than their NAI, but a few countries are harvesting at a level above it (e.g. Latvia and Estonia). Both of these countries have a high proportion of mature forest, which they are currently cutting to promote the development of their forestry sectors and as part of a process of converting their forests to more intensive management regimes. Already production in Latvia has started to decline a little and the government has informally indicated that it intends to bring production more into line with NAI.

In addition, these statistics suggest that four of the large traditional producers (Canada,[8] the United States of America, Sweden and Finland) might be harvesting very close to their levels of NAI, when the differences between underbark (production) and overbark (NAI) measurement, harvesting losses and fuelwood production are taken into account. On the other hand, they also show the huge potential for increased production in the Russian Federation.

The above information suggests that there may be little room to expand coniferous industrial roundwood production in Canada, the United States of America, Sweden and Finland under current forest management regimes. (However, a similar analysis of non-coniferous industrial roundwood production would show much more room for growth). In contrast, most other European countries, in particular the Russian Federation, have much more room for expansion.

[8] Another difficulty with interpreting the figures for Canada is that it is not possible to estimate how much of current production comes from the harvesting of natural forest losses. The harvesting of natural losses should be removed from total production in order to make an accurate comparison between production and NAI.

Supply and demand in other regions: the case of Europe

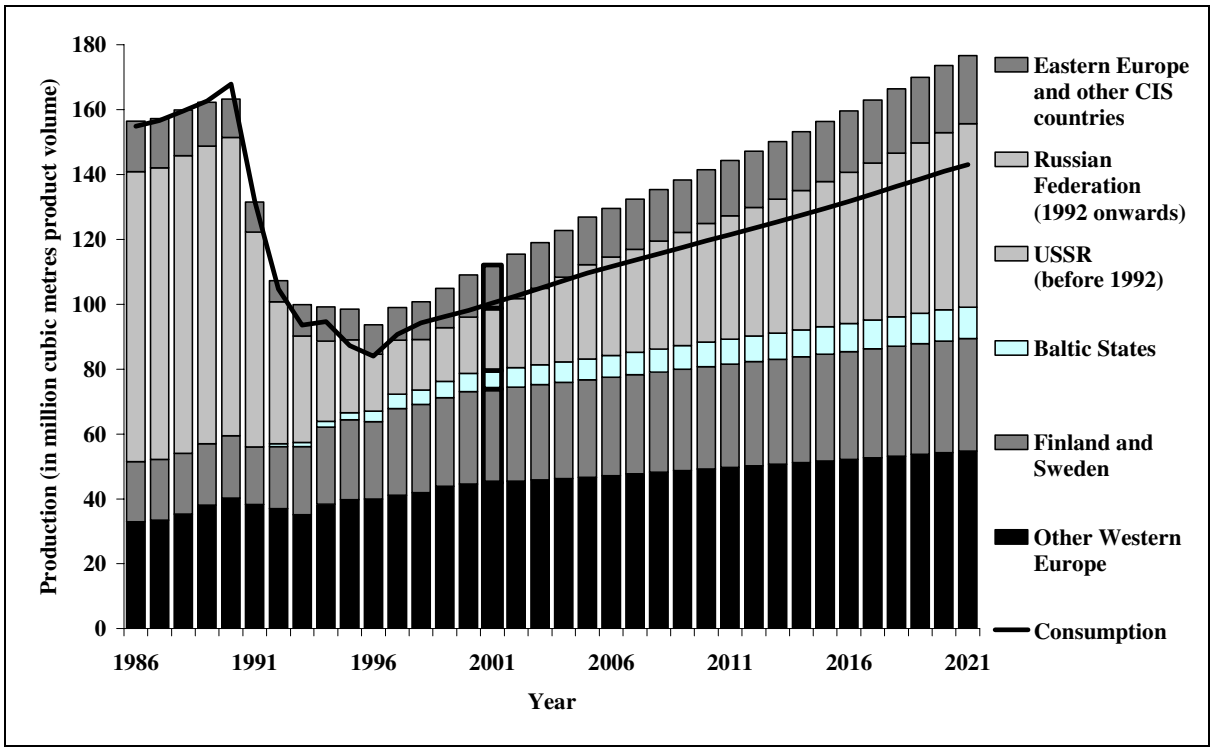
Outside of North America, one of the major export markets for Canadian and American forest products has traditionally been the countries of Western Europe. Therefore, it is useful to examine the outlook for these markets, to see if there is any scope for increasing trade with these countries in the future.

The latest projections for European markets are presented in the European Forest Sector Outlook Study (EFSOS), which is currently being finalised by the joint FAO-ECE office in Geneva. A brief description of the EFSOS projections for some of the main market sectors in Europe is given below.

Outlook for coniferous sawnwood production and consumption in Europe

The outlook for coniferous sawnwood production and consumption in Europe (including the former USSR) is shown in Figure 30. The solid line in this figure shows the outlook for consumption and the height of each bar shows the outlook for total production. The segments of each bar show the outlook for production by broad geographical region.

Figure 30 Outlook for coniferous sawnwood production and consumption in Europe (including the former USSR) by broad geographical region



Source: historical data: FAO (2003a); projections: Kangas and Baudin (2003).

As the figure shows, the region has changed over the last 15 years from a position of balance between coniferous sawnwood production and consumption to a position of net exports. The region is expected to remain a net exporter of coniferous sawnwood over the next 20 years, with net exports increasing from the current level of 10 million CUM (product volume) per annum to just over 30 million CUM per annum in 2021.

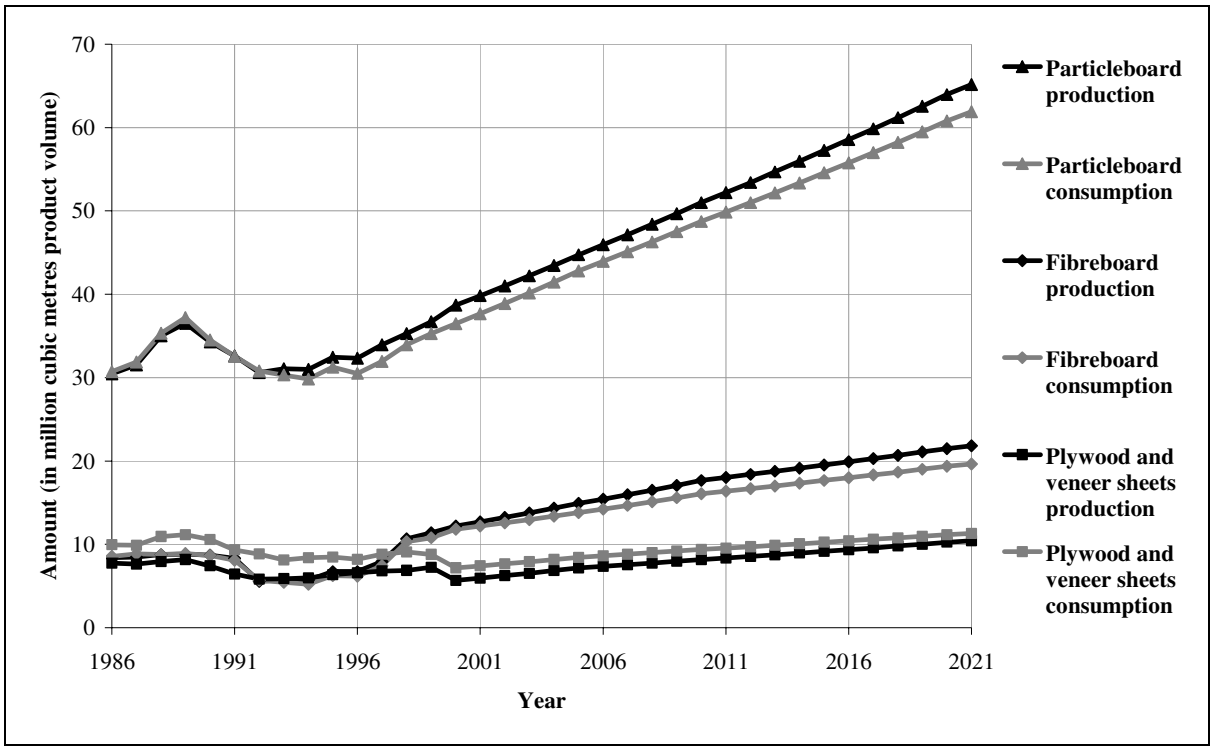
Growth in coniferous sawnwood production is expected to be highest in Eastern Europe and the CIS countries, while much lower growth in production is expected in Western Europe. Over the period 2001 - 2021, growth in coniferous sawnwood production in Finland and Sweden and the rest of Western Europe is expected to amount to only one percent per annum on average. Growth in production in the Baltic States and the rest of Eastern Europe and CIS countries is expected to amount to 2.6 percent and 2.3 percent per annum respectively. The highest rate of growth in coniferous sawnwood production is expected in the Russian Federation, where production is projected to increase by 5.5 percent per annum over the period. However, this figure must be treated with some caution, considering the trend of declining production reported over the last decade and the uncertainty about the outlook for the Russian economy.

The projections of production and consumption by region also suggest that Western Europe will remain a large net importer of coniferous sawnwood over the period and that net exports from the Russian Federation, Baltic States and the rest of Eastern Europe and CIS countries will increase over the period.

Outlook for wood based panel production and consumption in Europe

The outlook for wood based panel production and consumption in Europe (including the former USSR) is shown in Figure 31.

Figure 31 Outlook for wood based panel production and consumption in Europe (including the former USSR) by product type



Source: historical data: FAO (2003a); projections: Kangas and Baudin (2003).

The most striking feature of these projections is the expected increase in production and consumption of both particleboard and fibreboard over the period 2001 - 2021. Growth in the use of these two products is expected to be far higher than for any of the other types of solid

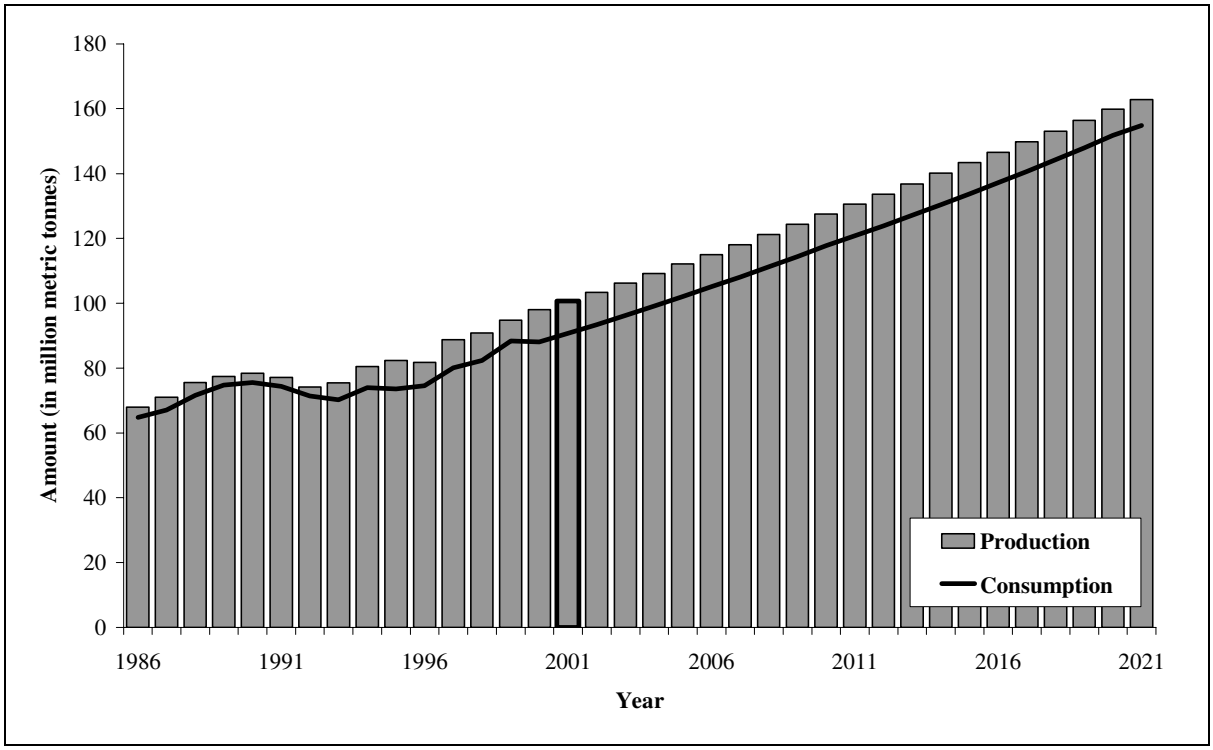
wood product, with average annual growth rates in production and consumption of 2.5 percent per annum for both types of product. With these high growth rates, these two reconstituted panels are expected to take a 35 percent share of the total solid wood products market by 2021.

The overall balance between production and consumption of wood based panels in the region is expected to remain relatively unchanged, with a small amount of net imports of plywood into the region and relatively small amounts of net exports of particleboard and fibreboard. Overall, net exports of wood based panels from the region are expected to increase slightly to 5 million cubic metres per annum in 2021. However, in contrast to the outlook for coniferous sawnwood, the regional balance of production and consumption is not expected to change by very much over the period. Production will expand faster than consumption in all major regions, such that net exports from Eastern Europe and the CIS countries will increase over the period while net imports to Western Europe will decline.

Outlook for paper and paperboard production and consumption in Europe

The outlook for paper and paperboard production and consumption in Europe is shown in Figure 32. Total consumption is expected to increase by 2.7 percent per annum over the period or from 88 million MT in 2001 to 155 million MT in 2021. Production is expected to increase by the same amount, such that net exports from the region remain relatively unchanged at about 8 million MT per annum.

Figure 32 Outlook for paper and paperboard consumption and production in Europe (including the former USSR)



Source: historical data: FAO (2003a); projections: Kangas and Baudin (2003).

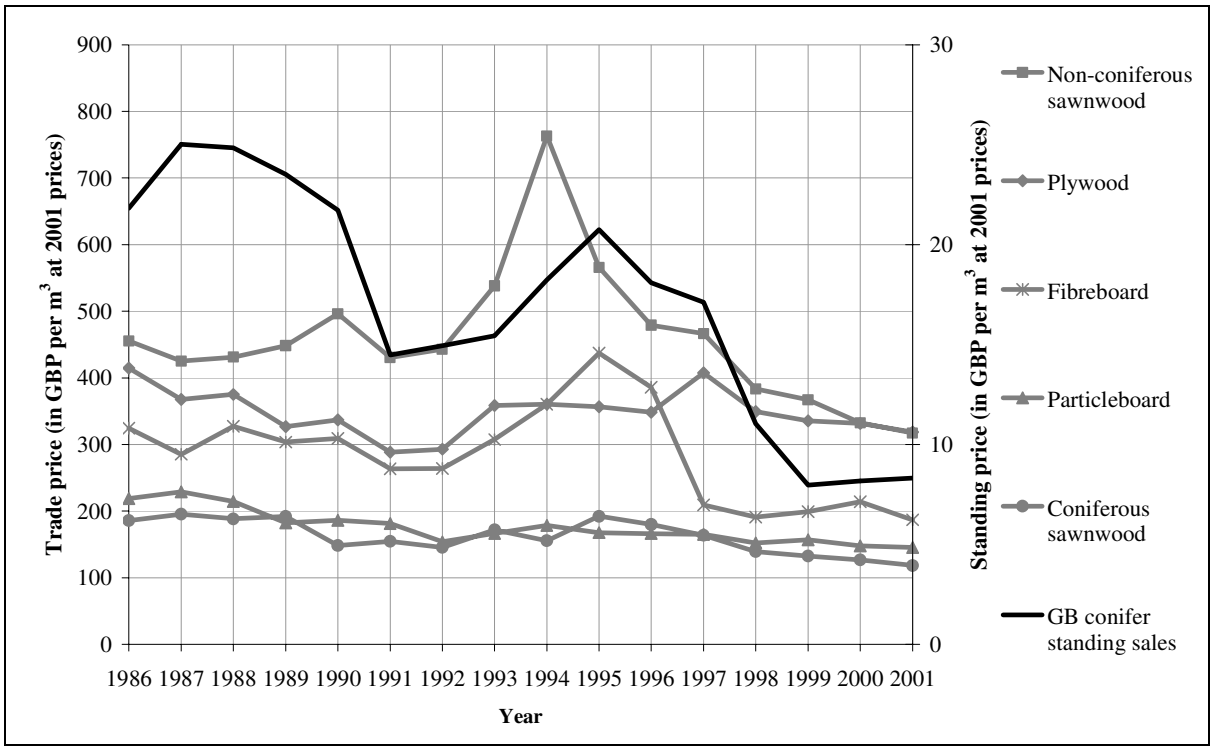
By product type, growth in production and consumption of printing and writing paper is expected to account for the majority of growth in the paper and paperboard sector, with relatively low rates of growth for newsprint and other paper and paperboard.

In terms of the regional distribution of production and consumption, the outlook suggests that some significant shifts will occur in the balance of production and consumption in the different regions of Europe and the CIS countries. Consumption will increase faster than production in Western and Eastern Europe, such that net exports from Western Europe will decline over the period and net imports into Eastern Europe will increase. In the CIS countries the opposite will occur as production will grow faster than consumption and net exports from this region will increase to offset the decline in net trade in the other two regions.

Current market conditions in Europe

Although the above analysis implies quite a bright future for forest products markets in Europe, it is worth noting that forest owners and the forest industry across much of Europe are currently suffering from very depressed prices. For example, Figure 33 shows recent trends in real prices for a number of forest products in the United Kingdom. The grey lines show the trends in international trade prices (measured on the left-hand vertical axis) and the black line shows the trend in coniferous standing sales prices in Great Britain (measured on the right-hand vertical axis) as reported by the Forestry Commission (2002b). All of the figures have been adjusted for inflation (i.e. converted to 2001 price levels).

Figure 33 Recent trends in forest product prices in the United Kingdom



Source: FAO (2003a) and Forestry Commission (2002b).

The above figure shows that the international trade prices of all solid wood products have declined over the period in real terms. Non-coniferous sawnwood and plywood are generally the two most valuable solid wood products in the United Kingdom and are currently sold for

just over GBP 300 per cubic metre. However, their prices have declined in real terms by one-third and one-quarter respectively since 1986. Fibreboard, particleboard and coniferous sawnwood prices have declined by similar amounts over the period. Fibreboard prices have declined by over one-third in real terms from just over GBP 300 per cubic metre in 1986 to just under GBP 200 per cubic metre in 2001. Particleboard prices have declined by about one-third over the period from GBP 210 to GBP 140 per cubic metre and sawnwood prices have also fallen by one-third from GBP 180 to GBP 120 per cubic metre. To some extent, these trends mirror those in the American market, which were shown in Figure 19.

The link between solid wood product prices and domestic roundwood prices is also shown very clearly in this figure. For example, the decline in coniferous sawnwood prices and particleboard prices between 1989 and 1991 would seem to explain the fall in standing sales prices over the same period. In addition, the peak in fibreboard and coniferous sawnwood prices in 1995 is matched by a peak in standing sales prices in the same year.

Overall, standing sales prices in Great Britain have fallen by about two-thirds from an average of around GBP 22 per cubic metre in 1986 (at 2001 prices) to GBP 8 per cubic metre in 2001 The United Kingdom is not alone in this respect and a number of other European countries have reported similar difficulties to FAO. At these price levels, the income from harvesting operations is so low that many forest owners are reconsidering their harvesting plans and investigating alternative ways of making money from their forests.

Implications for industrial roundwood production and prices

Some of the most important features of the global trends described above are as follows:

- Changes in natural advantage are taking place to the benefit of locations where trees grow more quickly, land and labour costs are relatively low and where there is an "*enabling environment*" for the development of a prosperous forestry sector. This is likely to lead to an increase in the relative importance of industrial roundwood production in some tropical and sub-tropical countries and temperate countries in the Southern Hemisphere.

- Many of these countries are rapidly establishing forest plantations to take advantage of the benefits of concentrating supply in the most favourable locations. It is expected that the future supply of industrial roundwood from forest plantations should be sufficient to meet any increases in demand for industrial roundwood in the foreseeable future.

- Changes in processing technology are also extending the use of the existing forest resource into areas that were previously considered as uncommercial. This is likely to result in the increased use of non-coniferous species in the future relative to the use of coniferous species.

The main implication of these trends is that there is significant potential to increase supply all over the World. This supply-push is likely to apply downward pressure on prices in roundwood and forest products markets, with the consequence that it may become increasingly difficult to maintain profitability in some of the traditional producer countries.

TECHNOLOGY TRENDS IN FOREST PRODUCTS MARKETS AND PROCESSING

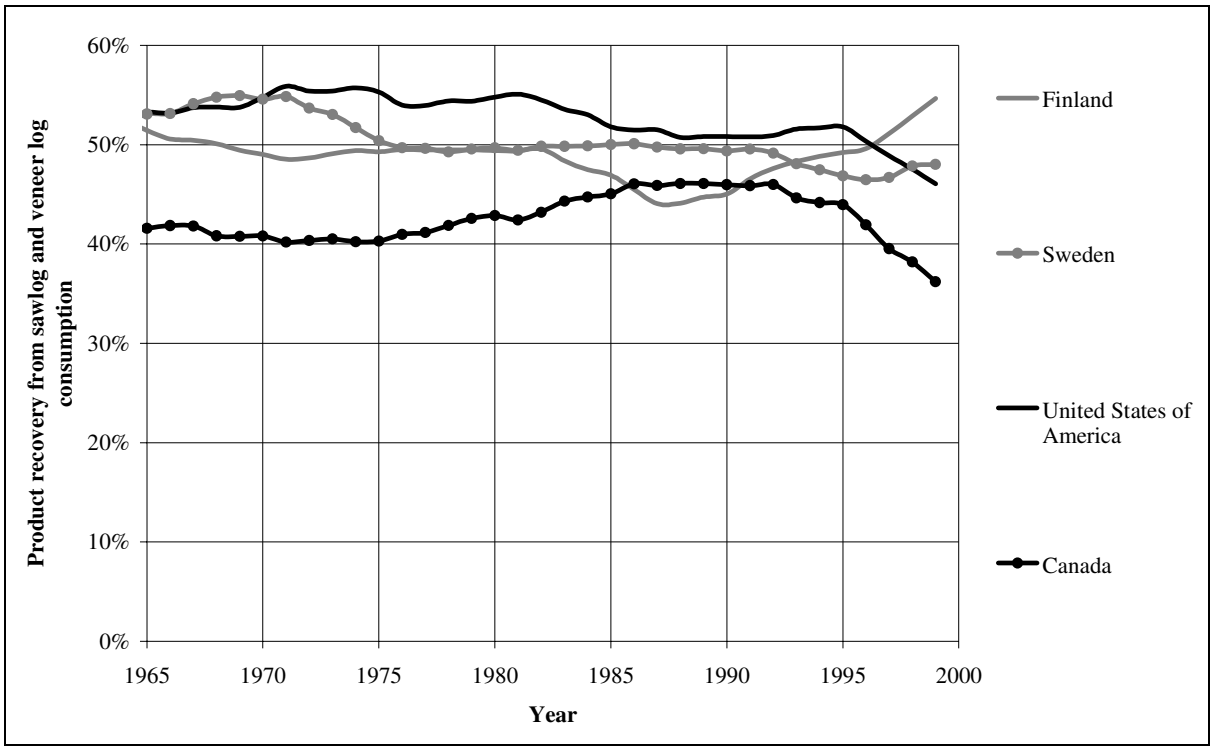
The last section described a number of broad global trends that are shaping the forest products markets of the future. One aspect of these trends that deserves particular attention is the role that changes in technology are playing in current and future developments.

It has already been mentioned how improved processing technology is enabling the utilisation of smaller sized trees as sawlogs and the utilisation of species previously considered to be non-commercial. This section describes some of the other trends in the forest processing industry and end-uses that may expand forest products supply without necessarily increasing the demand for industrial roundwood.

Technological improvements in product recovery

Technological improvements in processing efficiency not only enable smaller sized trees to be used as sawlogs and veneer logs, they should also result in increased production of sawnwood and plywood from any given tree size. Figure 34 shows trends in product recovery from sawlogs and veneer logs in Finland, Sweden, Canada and the United States of America since 1965. This has been calculated by dividing total sawnwood and plywood production by the consumption of sawlogs and veneer logs. Unfortunately, the figure does not demonstrate any noticeable trends. Given that processing technology has undoubtedly improved over the last four decades, this figure would seem to confirm the statement made earlier that average the tree size utilised in the sawnwood and plywood sectors has probably reduced.

Figure 34 Trends in the production of sawnwood and plywood from sawlog and veneer log consumption (product recovery) in a selection of major producers



Source: FAO (2003a). Note, the figures presented above are five-year moving averages.

This above conclusion is also supported by a study carried-out for FAO by the Forest Products Laboratory at Madison, Wisconsin (FAO, in prep). Based on a detailed review of studies of product recovery at mills throughout North America over the last 30 years, this report indicated that the maximum product recovery rates for sawnwood and plywood production are probably about 50 percent and 45 percent respectively. The conclusion of this analysis was that the majority of the processing sector in the United States of America was probably currently achieving product recovery rates close to these levels and that the scope for further improvements is negligible.

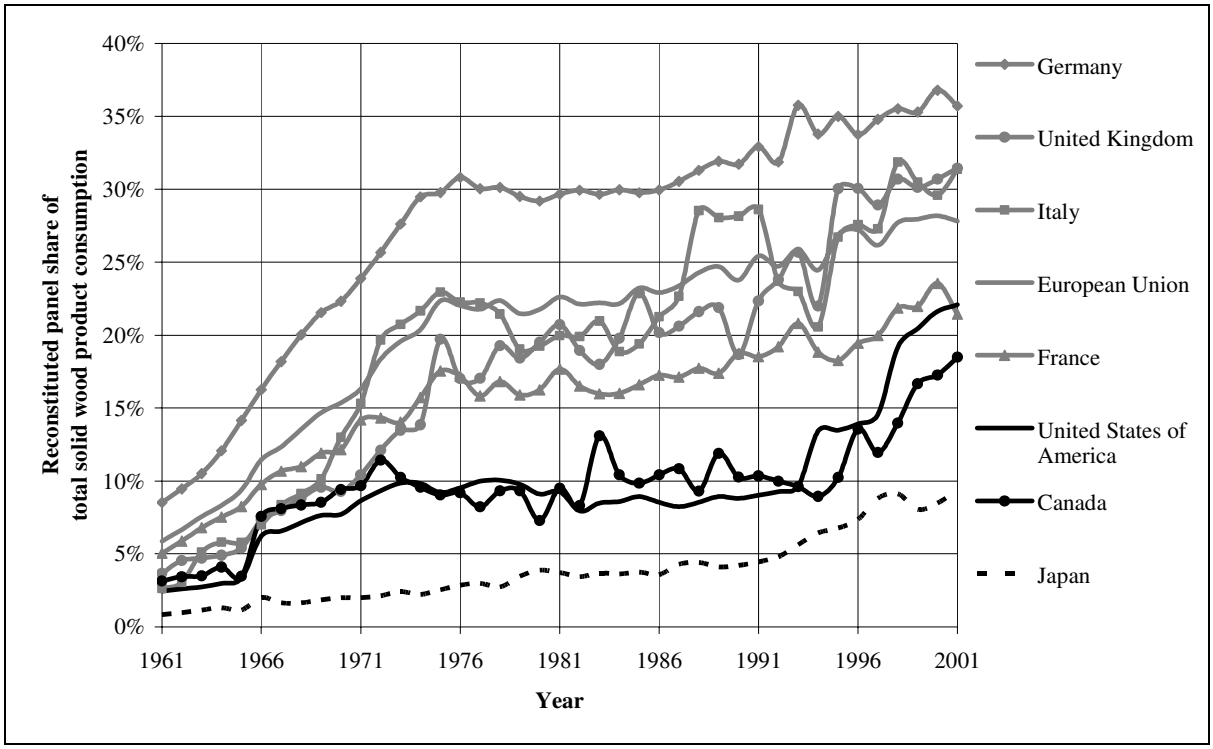
However, if this is so, one noticeable feature of the above figure is that the product recovery rate in Canada is generally much lower than in the other three countries and has tended to fall in the range of 40 percent to 45 percent. Since it seems unlikely that the quality of the resource there is significantly worse than in the other three countries (particularly Sweden and Finland), this would seem to suggest that there may be some scope for increasing product recovery rates in Canada.

Trends in end-use demand in the solid wood products sector

The second important technology trend is the increasing importance of reconstituted panels in the markets for solid wood products. As already shown, the consumption of particleboard and fibreboard has increased significantly in recent years in Canada and the United States of America. This has not been due to sudden changes in the demand for traditional reconstituted panels, but rather it has largely been due to the development and introduction of new types of panel products, most notably OSB and medium density fibreboard (MDF). Both of these panels are very competitive substitutes in a number of applications that would have used sawnwood or plywood in the past.

As already noted, the GFPM projections have failed to account for the substitution between these products that is currently taking place. Thus, it can be expected that the share of these products in total solid wood product consumption in Canada and the United States of America will increase in the future. To get an idea of how much of a change could take place, comparisons can be made with some other countries where reconstituted panel products have already had more of an impact.

Figure 35 Trends in the relative importance of reconstituted panel consumption in a selection of developed countries



Source: FAO (2003a).

Figure 35 compares the share of reconstituted panels in total solid wood product consumption in a number of developed countries. This figure clearly shows the increased importance of these products in Canada and the United States of America over the last decade. However, it also shows that many European countries have been using relatively more reconstituted panels for the last 20 years.

The rise in importance of reconstituted panels in Europe pre-dates the development of OSB and MDF. Their importance in Europe is possibly less to do with the development of new panel products and more to do with the wood supply situation in Europe. In general, wood in Europe is relatively scarce and expensive compared to North America, so the processing industry there has developed markets for products that meet end-users needs but require less wood (and cheaper wood) to manufacture. The introduction of OSB and MDF has just been a continuation of these developments.

Of course, in North America, the availability of wood and market conditions are different to Europe, but this figure shows that there is probably still room for considerable growth in the use of reconstituted panels in North America.

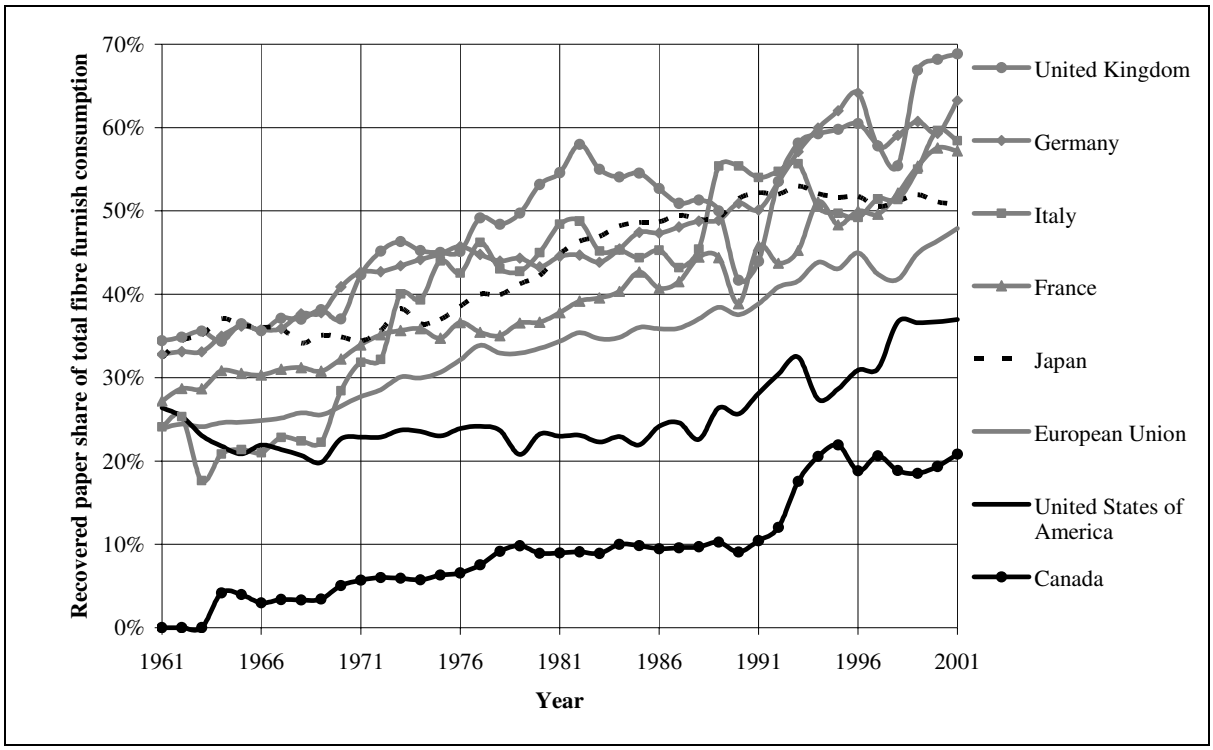
If the use of reconstituted panels in Canada and the United States of America increases significantly beyond current levels, this will alter the demand for industrial roundwood. There will be less demand for higher quality sawlogs and veneer logs and relatively more demand for pulpwood and wood residues. Already, recent trends in product markets would seem to indicate that these sorts of changes might be starting to take place. With the higher product

recovery rates of reconstituted panels, these trends would also suggest that future total consumption of industrial roundwood might also be less than would otherwise be the case.

Trends in fibre inputs for the paper and paperboard industry

The third important technology trend is the increasing importance of recovered paper as a source of fibre furnish for the paper and paperboard industry. Figure 36 shows the trends in recovered paper consumption as a proportion of the total consumption of fibre furnish in a number of developed countries.

Figure 36 Trends in the relative importance of recovered paper as a source of fibre furnish in a selection of developed countries



Source: FAO (2003a).

As this figure shows, the importance of recovered paper in Canada and the United States of America has increased, but still lags behind the situation in most other developed countries. Again, these differences between North America, Europe and Japan depend on a number of factors such as wood pulp prices, the cost of paper recovery and environmental laws and policies. For example, it is unlikely that it would ever be cost effective for Canada to try to approach the levels of recycling that are common in much of Western Europe. However, considering that the United States of America currently exports wastepaper, there is some potential to increase the use of this resource there.

The GFPM projections include an assumption that the proportion of total paper consumption that is recycled will grow in the future at the same rate in the past. Thus, an expected increase in the availability of this fibre source is already included in the projections. However, this variable is subject to some uncertainty, in particular with respect to future environmental policies and laws. Experience from Europe has shown that determined efforts by governments

to encourage recycling can result in significant changes in this sector. Therefore, this information is presented here to reflect the uncertainly in the future in this sector and to provide an indication of what could happen in the future if stronger recycling policies were introduced.

Implications for industrial roundwood production and prices

The above analysis has examined a number of ways in which increased demand for forest products could be met by changes in technology rather than increased industrial roundwood production. Although the scope for increased product recovery rates seems limited to Canada, developments in the other two aspect of technology examined here might present some opportunities in the future.

Current experiences from around the World have shown that a number of countries have already experienced profound changes in technology and there is a real possibility that these changes might have a greater impact on the forestry sector in Canada and the United States of America in the future.

To some extent, these demand-pull factors also reinforce some of the supply-push factors noted in the last section. For example, improvements in processing technology and greater use of reconstituted panels would all tend to support the race to the bottom of the market on the industrial roundwood supply side.

Overall, these trends are likely to exert downward pressure on the demand for sawlogs and veneer logs and increase demand at the bottom of the market. Furthermore, some of the increase in the demand for pulpwood could be deflected by the greater use of recovered paper. Thus, it seems likely that the increasing importance of the reconstituted panels sector in pulpwood markets is likely to continue. Given that the roundwood quality standards required in the reconstituted panels sector are generally lower than those required in the wood pulp sector, this may even reduce the demand for wood quality at the bottom of the market.

When taken together, these trends all suggest that there will be continued downward pressure on industrial roundwood prices.

OTHER BROADER TRENDS THAT MAY AFFECT THE FUTURE OF THE FORESTRY SECTOR

The above analysis has focused largely on changes within the forestry sector that may affect the future of the sector. In addition to these, there are broader economic, social and environmental changes taking place that could have a major impact on the future development of the forestry sector.

Economic trends

The most important economic variable that affects future supply and demand is the growth in the size of national economies. This variable is already included in the GFPM, so future expected changes in economic growth are already built into the projections presented earlier. However, as noted at the start of this analysis, this reduction of the analysis to one simple driving force may overlook other economic variables that are more difficult to include in the modelling process but are also, nevertheless, quite important.

General decline in commodity prices

One feature of nearly all commodity markets is that, over the long-term in the past, prices have nearly always fallen in real terms. Most models of supply and demand fail to capture this and, indeed, in many cases they tend to make optimistic assumptions that prices will remain the same in real terms or even increase in the future.

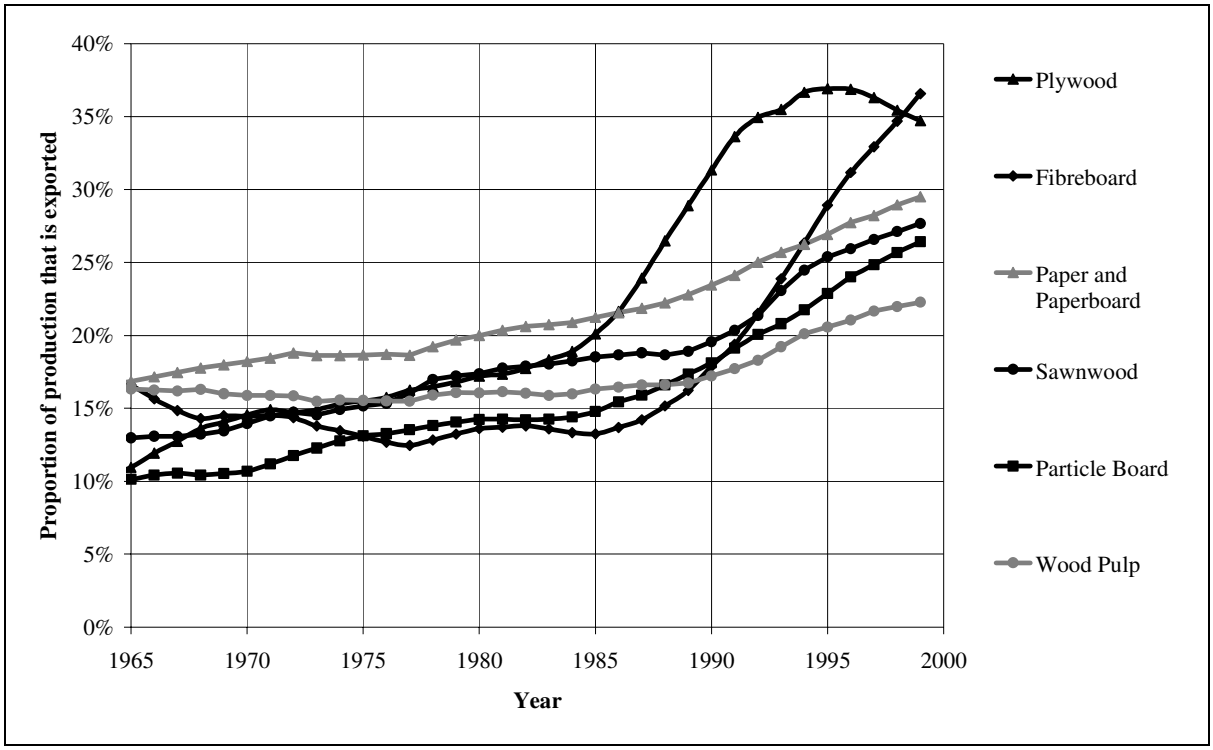
This decline in commodity prices is a result of the process of economic growth. As economies develop, wealthier consumers demand increasingly sophisticated products. The prices of the basic commodities that are used to manufacture these products tend to stay the same, so as the prices of all goods and services increases over time (due to this increased value-addition), the relative prices paid for the basic commodities declines. As price inflation is calculated on the basis of the prices of all goods and services produced in an economy, this results in falling commodity prices in real terms over the long-run.

The only case where commodity prices might increase is where commodities are fixed (or nearly fixed) in supply or there are strong cost-push factors that will increase their costs of production. In general, the forestry sector has not reached this position and is not likely to do so in the foreseeable future. Thus, there is a strong and fundamental economic principle that would tend to support the view that roundwood prices will continue to decline in the future.

Economic liberalisation and globalisation

Most supply and demand models also fail to account for sweeping changes in the global trading environment. Because they are largely based on an extrapolation of what has happened in the past, they fail to account for the supply-side benefits (e.g. global sourcing of materials, lower production and transactions costs) that trade reform, economic liberalisation and general globalisation can produce.

Figure 37 Trends in the globalisation of forest products markets



Source: FAO (2003a). Note, the figures presented above are five-year moving averages.

Taking the global forest products market as an example, Figure 37 shows how the importance of international trade (in terms of the amount of production that is exported) has increased since 1965 and, in particular, since the mid-1980s. As this figure shows, the importance of trade has increased by around 15 percentage points in most cases and sometimes even more.

As countries are opened-up to more foreign competition, the laws of competitive advantage come into play, prices tend to fall, consumers benefit and producers feel the pain (especially the uncompetitive producers). To some extent, this is what is currently happening in Europe, with the opening-up of Eastern Europe.

Technology and the movement of capital have also become increasingly globalised, so that countries can no longer rely on a technologival advantage in production.

For the forestry secotr in a numbrer of developed countres, the next big challenge will be the expansion of the European Union to include some of the countres in Eastern Europe. Domestic producers and exporters to Western Europe will face increasingly stiff competition in this market and, more generally, some of the new member countres will be able to play a larger role in global forest products markets with the benefit of increased trade and investment in their forestry sectors. Once this has happened, the next wave of liberalisation is only a decade away as the countries of Latin America complete their progress towards greater market and economic integration.

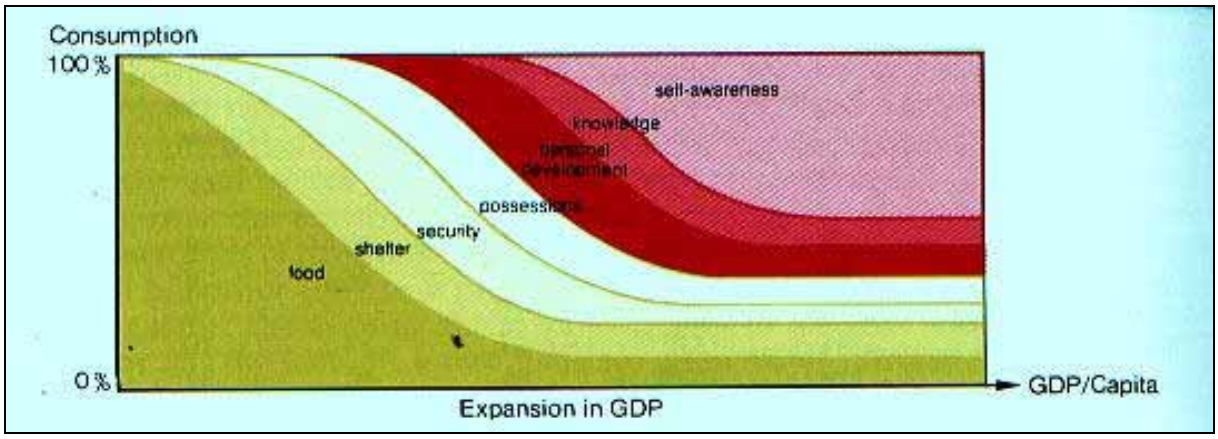
Social and demographic trends

Social and demographic trends are also largely excluded from most formal models of supply and demand. While it is generally more difficult to quantify some of the impacts of such changes, a qualitative assessment can provide an insight into the future that can help decision makers in the forest sector to plan for the future.

Increased personal incomes

Increased personal incomes tend to lead to changes in social needs and values. As Ernst (1978) noted, with higher incomes, people tend to focus less on meeting their basic requirements (such as food, shelter and security) and more on personal development, knowledge and self-awareness (see Figure 38). Thus, the structure of demand for goods and services becomes more orientated towards services and quality rather than price takes on more importance.

Figure 38 The trend from basic to higher order needs with increased personal income



Source: Rennel (1984).

In the forestry context, it can be expected that increased personal incomes will lead to more demand for forest services relative to wood production and more demand for high quality products (e.g. "*positional goods*", such as traditional hardwood furniture and personalised stationery). Many developed countries have already reached the stage where a huge proportion of their economies are focused on the service sector, but the forestry sector is still focused on commodity production in many cases. These trends present a number of challenges for the forestry sector, but also opportunities in terms of new product development and innovative ways to make money from the forest.

Increased urbanisation

Most countries are also becoming increasingly urbanised and this trend is expected to continue well into the future. Increased urbanisation can subtly affect forest products markets on both the demand and supply-side.

On the demand-side, it tends to reinforce some of the trends described above. In many people, urbanisation leads to a loss of personal space and a sense of place, which leads to a greater interest in nature and all things natural. For example, numerous studies have shown how rural

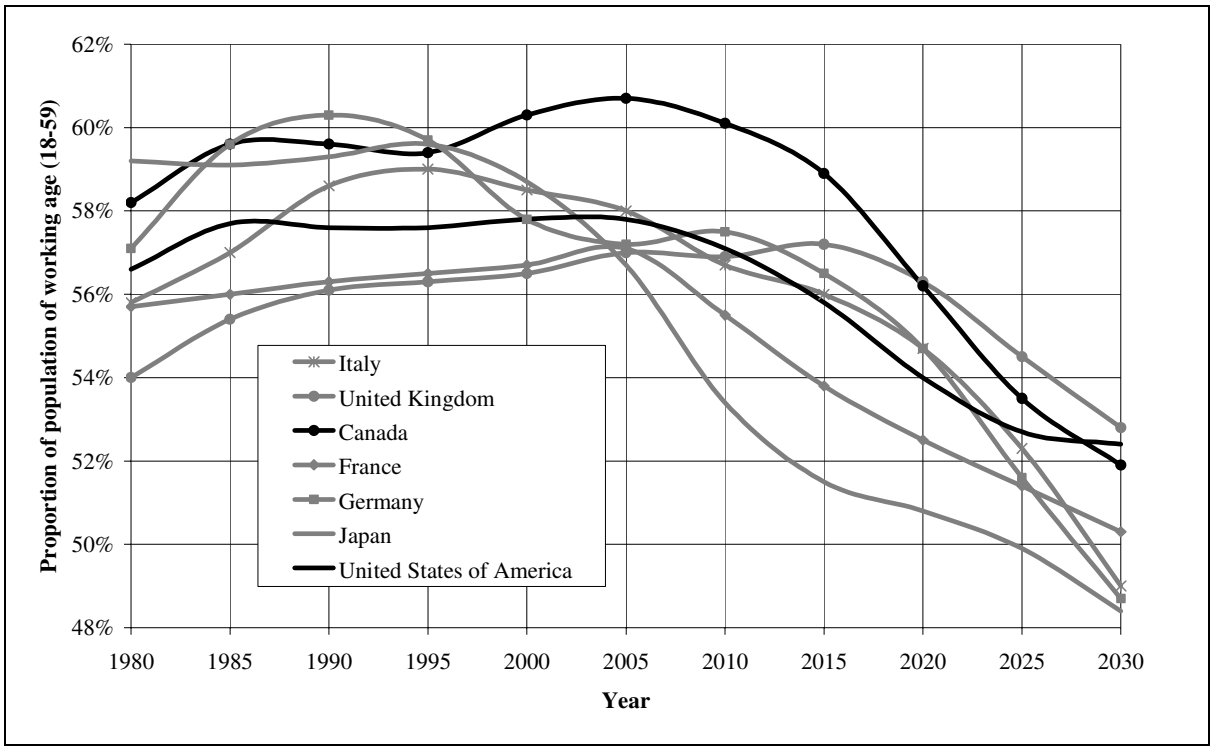
and urban dwellers have very different views of the countryside. The former see it as a place of production and economic activity, while the latter view it as an environmental asset. With greater urbanisation, the latter view will increase in importance, leading to more pressure to conserve forests, but also to an increase in the demand for forest services.

On the supply-side, urbanisation reduces the cost of collecting recycled materials. For example, the levels of recovered paper consumption in the countries shown in Figure 36 vary considerably between the countries shown in the figure, but the ranking of countries almost exactly corresponds to the degree of urbanisation in these countries. As countries become more urbanised in the future, the problems of waste disposal and the reduced costs of waste recovery recycling could have a profound impact on the supply of recycled forest products that would compete with roundwood from the forest.

Population age-structure

Significant changes in the population age-structure will take place over the next few decades in most developed countries. For example, in the largest developed countries, the proportion of the population in the age-class 18-59 (i.e. working age) will decline by about ten percentage points between now and 2030 (see Figure 39). Again, on the demand-side, this could have similar effects to those described above. However, it is on the supply-side that these developments might prove to be the most interesting.

Figure 39 Trends and projections for the proportion of population of working age in the G7 countries from 1980 to 2030



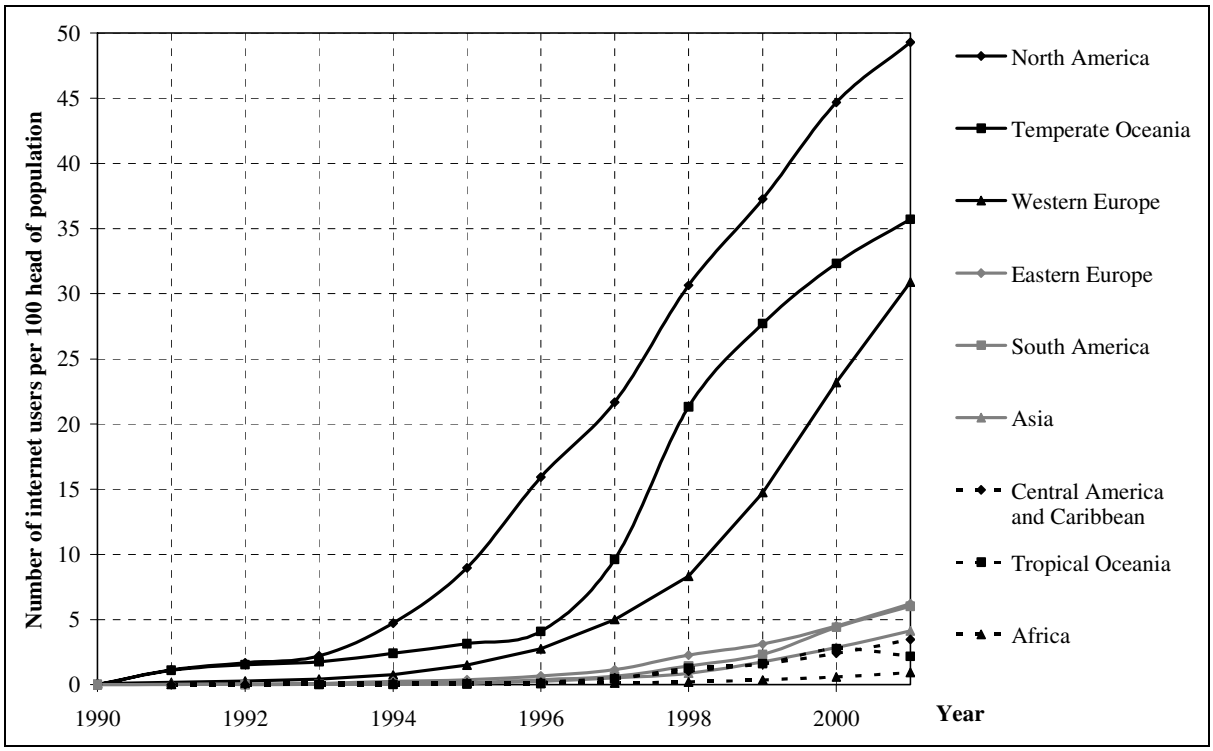
Source: UN (2002).

An ageing workforce presents the forest sector with both a problem and an opportunity. On the one hand, a tighter labour market is likely to apply upward pressure on labour costs, raising the costs of production throughout the sector. However, on the other hand, it will also raise labour costs in many end-use sectors. One of the most important end-users of forest products is the construction industry, where it is relatively difficult to substitute capital for labour. Therefore, this trend presents the forestry sector with an opportunity to move up the value chain.

The information revolution

One final trend that has probably had a major impact on forest products markets is the greater use of the internet as a source of information. To date, most models of forest products supply and demand have failed to account for this "*information revolution*", but there is little doubt that this, along with the greater use of computers more generally, has had a major impact on the markets for paper.

Figure 40 Trends in the number of internet users per 100 head of population



Source: ITU.

Figure 40 shows trends in the use of the internet since 1990 by broad geographical region. This shows that the use of the internet has been largely limited to developed countries to date with, for example, almost 50 percent of the North American population currently using the internet. Although not shown here, trends in personal computer ownership match the trends shown in Figure 40 almost exactly.

This rise in the use of personal computers is a major driving force behind the unprecedented rates of growth in printing an writing paper consumption that are currently being experienced in many developed countries. However, closer examination of Figure 40 suggests that this revolution is far from over. Although it seems unlikely that the very poorest countries in the

World will catch-up any time soon with the current levels of internet use in developed countries, the countries of Asia, Latin America and Eastern Europe are at the position that the developed countries were at about five years ago. Many of the countries in these three regions are experiencing high rates of growth in personal disposable incomes, so it seems possible that the high rates of growth in printing and writing paper consumption could continue for many years to come.

On the other hand, the rise in the use of the internet has also coincided with declining newspaper readership (see Table 4). The substitution of this new technology for newspapers was thought unlikely in the early 1980s (Rennel, 1984), but the combination of these two sets of trends would seem to suggest that the former has indeed substituted for the latter as the main source of information for many people. This could explain why there has been so little growth in newsprint markets over the last decade or so and it would seem to suggest that this situation is likely to continue or may even get slightly worse in the future.

Table 4 Trends in daily newspaper circulation (per 1,000 head of population) in a selection of developed countries

Country	Year				
	1980	1985	1990	1995	1998
Canada	221	215	209	165	n.a.
Finland	505	543	558	464	455
France	192	193	208	210	n.a.
Germany	n.a.	n.a.	305	313	305
Italy	101	97	105	100	n.a.
Japan	567	565	587	574	n.a.
Sweden	528	526	526	465	430
United Kingdom	417	397	388	345	n.a.
United States of America	270	260	245	218	n.a.

Source: UN.

Environmental trends

Of all of the possible trends outside the forestry sector, the most difficult to predict and incorporate into projections are trends in environmental policies and legislation.

On the supply side, restrictions on forest harvesting can reduce supply while greater regulation and oversight can increase costs in the sector. The possibility of such changes can be a significant risk in countries that do not have a stable policy environment and where large proportions of the forest estate are owned by the state.

Another supply-side issue is government policy towards recycling. Probably almost all of the recent increase in recycling of forest products has occurred due to policy interventions by governments at the national, state or local level. Sometimes these interventions can come in the form of incentives (e.g. subsidised collection schemes), but more recently the use of taxes on waste disposal has become increasingly popular. As already noted, such measures can have a profound impact on the forestry sector and they are another source of risk and uncertainty about any future projections for the pulp and paper sectors.

On the demand-side, a couple of areas of concern have started to affect thee outlook for forest products markets in some countries. Firstly, interest in the use of wood as a source of renewable energy has grown in some countries and a number of governments are currently examining their policy options in this area. In particular, in the European Union, the possibility of subsidies for wood energy production is being discussed. This could be of benefit to the forest owners in some countries, but it is currently a source of some consternation amongst the pulp and paper sector.

Another impact of taxes on waste disposal is that they may alter the demand for different types of forest product. In a number of countries now, the forestry sector is examining ways in which it can produce products that will result in less waste. Given that wood products can be re-used in a number of different ways, this presents an opportunity for the industry to strengthen competition against competing non-wood products.

IMPLICATIONS FOR THE FUTURE OF THE FORESTRY SECTOR IN THE GREAT LAKES FOREST AREA

This last section attempts to summarise some of the ways in which recent trends are altering the competitiveness of the forestry sector in the Great Lakes forest area (GLFA). It also describes some opportunities to take advantage of these trends, based on the market outlook and experiences in other countries.

Strengths, weaknesses, opportunities and threats

Table 5 summarises some of the strengths, weaknesses, opportunities and threats to future forestry development in the GLFA. This presents only a brief description of the sector and is based on what the trends and projections for markets imply, rather than detailed local knowledge of the GLFA.

In terms of the **forest resource**, the GLFA is endowed with an abundant forest resource, but the natural advantages that this resource has provided in the past are being slowly eroded by changes in technology and the growth of forestry in other parts of the World. In particular, the rise of forest plantations presents a growing threat. Therefore, the forestry sector in the GLFA should focus on producing the goods and services that these other regions can not supply.

In terms of **capital and technology**, the region has also benefited in the past from a competitive advantage in its use and development of technology. However, this is also being eroded by the globalisation of technology. The main technological advantage in the future is likely to come from knowing how to best use this technology rather than the simple substitution of capital for labour.

In conjunction with this, one area where the region can attempt to maintain an advantage is in terms of the skills and knowledge of the **labour** force. At the high-end of the labour market, this is one of the few areas where globalisation has had less of an impact. Outsourcing some production and service functions to countries with low labour costs has occurred in many other sectors, but the scope to do this in the forestry sector is more limited. As above, focus should be on getting the most value-added out of labour, but this should emphasis increasing the value of production rather than cost-cutting

On the **demand-side**, the GLFA still has the benefit of being well located to take advantage of the huge market for forest products in the United States of America. However, globalisation will lead to more competition in export markets in the future and some of this market is exposed to this force. The recent increases in fibreboard imports from Germany and pulp imports from Brazil are examples of what could happen in the future. Some of the more innovative markets are still in their infancy but show good prospects for future development. The challenge will be to move quickly into some of these markets before competitors do. Local knowledge of the needs and requirements of end-users should help in this respect.

Finally, in the **policy** arena, the region benefits from a long history of stable and supportive policies towards the sector. This should continue in the future, but adapt to the changing needs of the sector.

Table 5 Summary of strengths and weaknesses of the forestry sector in the Great Lakes forest area and opportunities for growth

Variables affecting competitiveness	Strengths	Weaknesses	Opportunities	Threats
Factors of production: Resource availability and type	Abundant forest resource, with highly developed infrastructure. High quality wood properties.	Slow growth of the forest resource compared with other regions and forest plantations. Technological substitution is reducing the importance of wood quality.	To increase value in the forest, focus on goods and services that forest plantations can not produce. Low cost silviculture to compete with other forest resources. In the industry, develop and exploit niches in the traditional forest product markets and expand into new markets.	Transactions costs and limited demand for forest services due to low population density. Low cost silviculture could conflict with other forest management objectives. Markets for traditional forest products are growing slowly, new and growing markets rely less on wood quality.
Capital and technology	The region has a long history of adoption of new technology.	Capital and technology are globalised and can also be introduced fairly easily into competing regions.	Need to use technology in new ways to move up the value chain rather than cut costs (e.g. engineered wood products). Markets for some of these products are still in their infancy.	Strong competition - everybody wants to move up the value chain! Attractiveness of investment and cost of capital?
Labour	Highly skilled and adaptable labour force.	Labour costs are relatively high compared with some competing regions. Ageing workforce could increase labour costs in the future.	Increase value-added by increasing the value of production rather than by substituting capital for labour.	Strong competition from other developed regions with similar characteristics.
Demand variables:	Huge market in the United States of America for which this region is well located. Long history of supplying this market.	Globalisation is leading to increased international trade in forest products. Some parts of the market are exposed to competition from outside the region.	Ageing workforce in end-use sectors will lead to greater demand for value-added products.	Reorientation of production towards new market niches may only alter the composition of demand rather than the total level of demand. Some will lose out during this process.
Policy variables:	Stable policy environment and a long history of supportive government policies towards development of the forestry sector.	High proportion of government ownership of forest resources, possibly reducing the flexibility of production in some respects.	Government can support development by creating an "*enabling environment*" and encouraging the formation of forestry clusters.	There is always a risk of misdirection due to vested interests and special interest groups.

Opportunities to increase value-added from existing production

There are two fundamental ways to increase value-added in any industry. The first of these is to cut costs and the second is to increase the value of production. At a recent presentation in British Columbia (Carter, 2003), it was suggested that the future there lies in continued cost-cutting and continuation of the focus of production on commodity markets. However, with the cost structures and market opportunities in the GLFA, it seems that the opposite might be true in this region.

Forestry is increasingly becoming a knowledge-based activity, which is dependent on the use of human skills to turn a basic product (fibre) into a valuable product that consumers want to buy. The application of technology as part of this process is becoming less of an advantage for specific regions, as technology is now an increasingly globalised factor of production. Therefore, in a high labour cost economy, the only way forwards is to use the skills of that labour to their maximum advantage through improved management, productivity and marketing.

Adding value in the forest

Historically, the way that most countries have tried to add value in the forest has been through the intensification of silviculture and management. While this may work in fast growing forest plantations, the returns to investments in silviculture are much lower in slow-growing natural forest. Indeed, many interventions may actually destroy value in the forest rather than add value (see Figure 41).

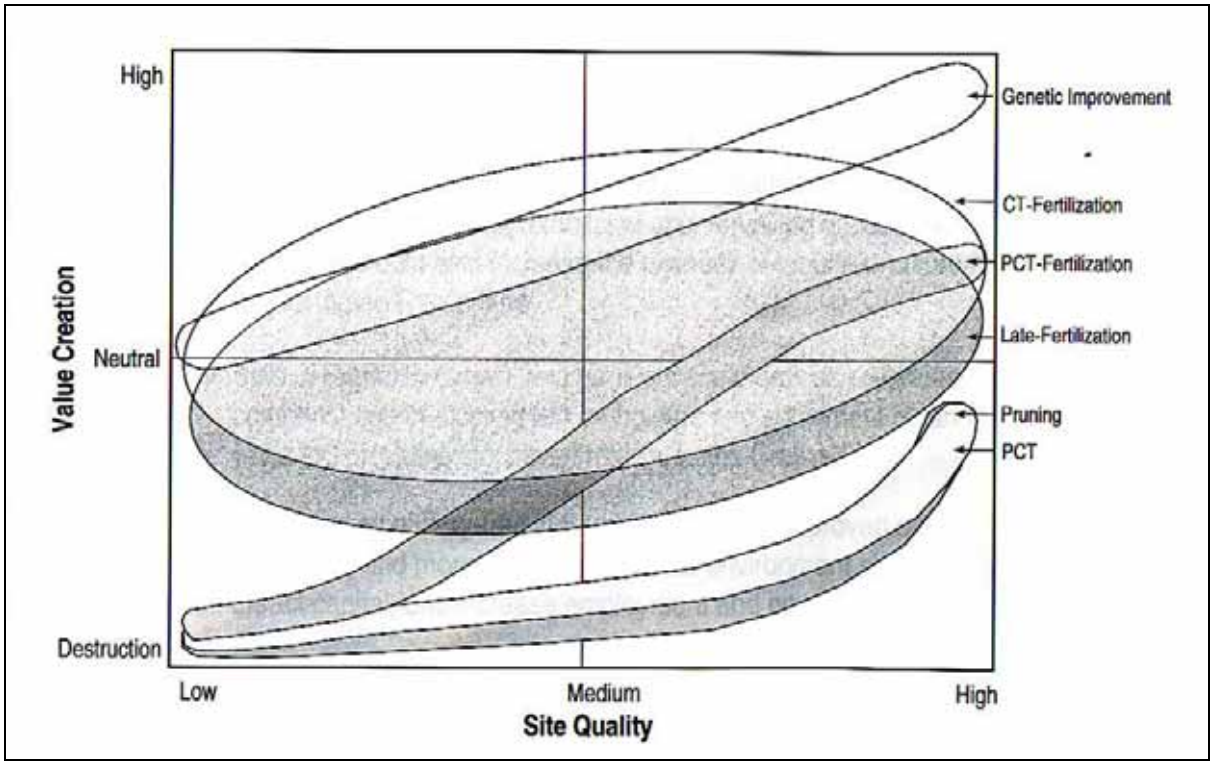
In the future, improving the profitability of forest management is more likely to depend on the development of low-cost silvicultural regimes, the sale of non-traditional goods and services (see below) and shortening rotation lengths. With respect to the latter point, there is already anecdotal evidence that this starting to happen in many countries and the improvement of processing technology and changes in end-use markets will further reinforce this trend.

Adding value in the industry

The future for adding value in the industry is likely to come from the development and growth of markets for new engineered wood products (EWPs) such as: pre-cut lumber; lumber components; parallam; timberstrand; laminated veneer lumber (LVL); and OSB. The benefits of these new products come from:

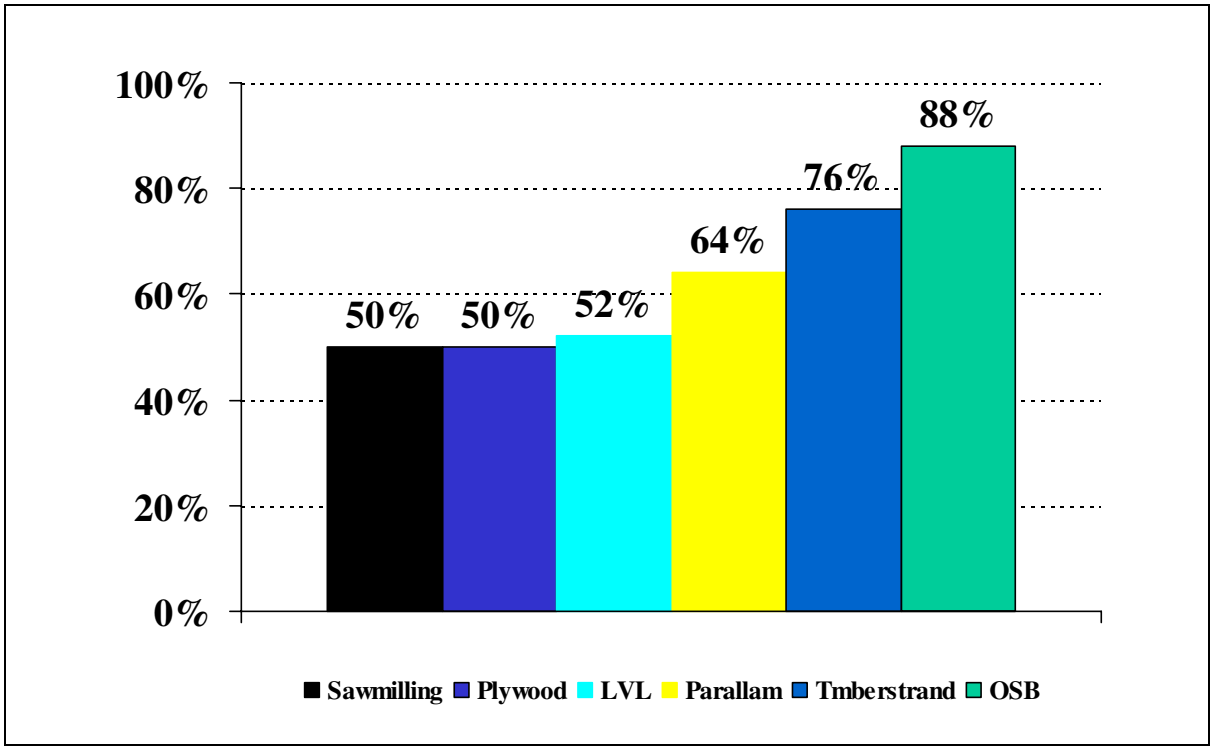
- improved product recovery rates, leading to lower wood input costs (see Figure 42);
- more predictable performance and less dependence on species and wood quality;
- less need for labour inputs in end-use sectors; and
- less construction waste and waste in other uses.

Figure 41 Silvicultural investments offer few economic opportunities to increase volume or value in British Columbia



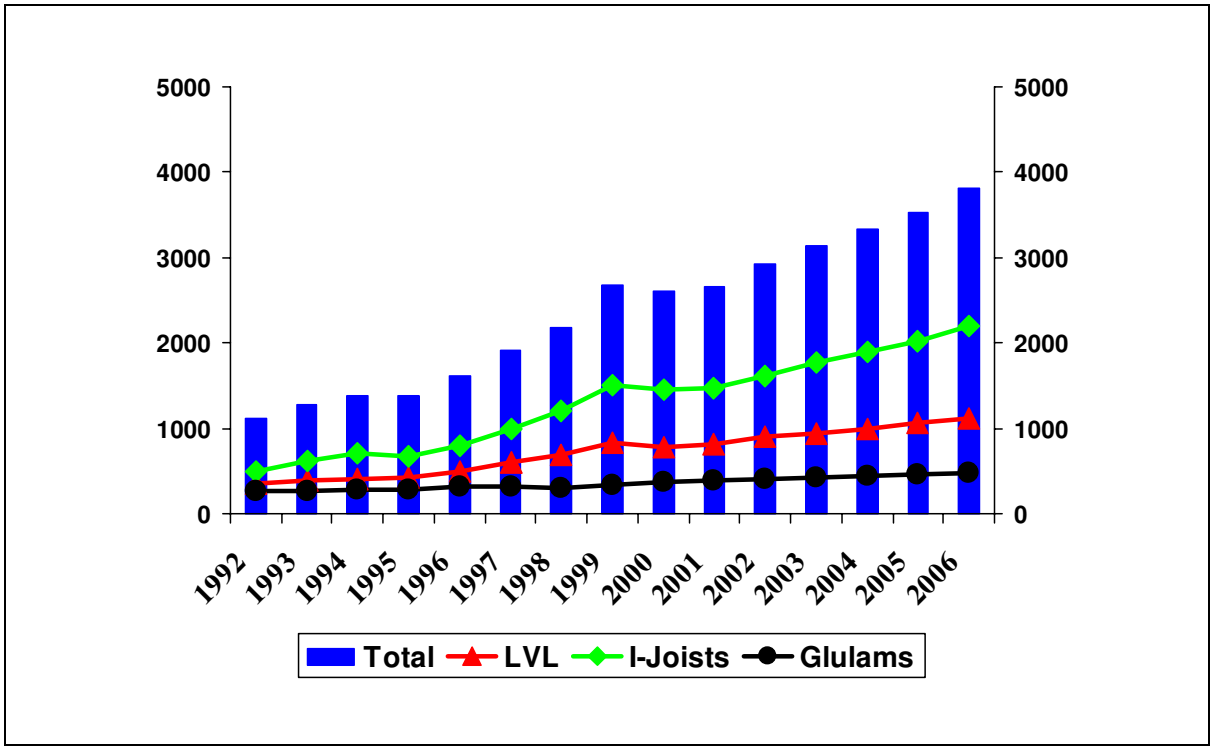
Source: Carter (2003).

Figure 42 Current levels of product recovery amongst different structural wood products in the United States of America



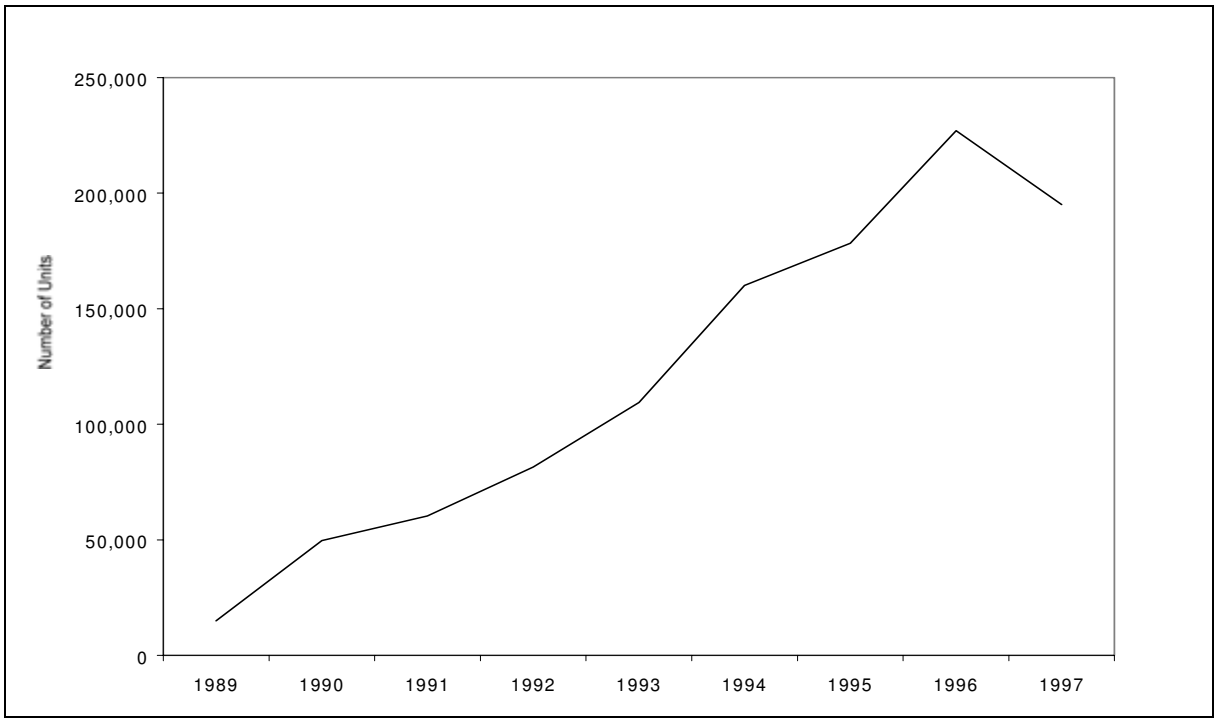
Source: Schuler (2002).

Figure 43 Trends in the use of EWPs in the United States of America



Source: Schuler (2002). Note, these figures are in million board foot equivalent.

Figure 44 Trends in the number of houses in Japan built with pre-cut lumber



Source: Japan Forest Products Journal Annual Market Report.

Already, EWPs have grown to take a significant share of the construction market in the United States of America, roughly equal to about five percent of sawnwood consumption (see Figure 43) and further rapid growth in this sector is expected in the future. With a rapidly ageing labour force in Japan, the use of pre-cut lumber and building components has also developed there from almost nothing to become a significant market sector (see Figure 44), which the Scandinavian forestry sector has taken advantage of.

Development of forestry clusters

Industry clusters are locations where a whole range of firms have come together to develop competitive and dynamic centres of industrial growth focused on a particular sector. The most notable of these in North America are "*Silicon Valley*" and the aircraft industry cluster in Seattle.

There are also a number of significant forest industry clusters around the World, the most notable of which are the Nordic forest industry cluster and the forestry cluster that has developed in Southern Brazil. Other countries are seeking to promote the development of forest industry clusters to take advantage of their growing forest resources (e.g. New Zealand and Scotland).

Successful industry clusters are characterised by the following factors:

- strong natural advantages (e.g. a significant forest resource, low input costs);
- highly developed infrastructure;
- the presence of numerous supporting industries (e.g. supplier, management consultants, research institutions, universities and training facilities); and
- a supportive policy environment from local and national governments.

By bringing together all of these factors, strong competition as well as collaboration develop into what is known as "*competation*" that benefits the sector as a whole. As some of the above characteristics are already present in the GLFA, there may be scope for the development of a forest industry cluster in the GLFA.

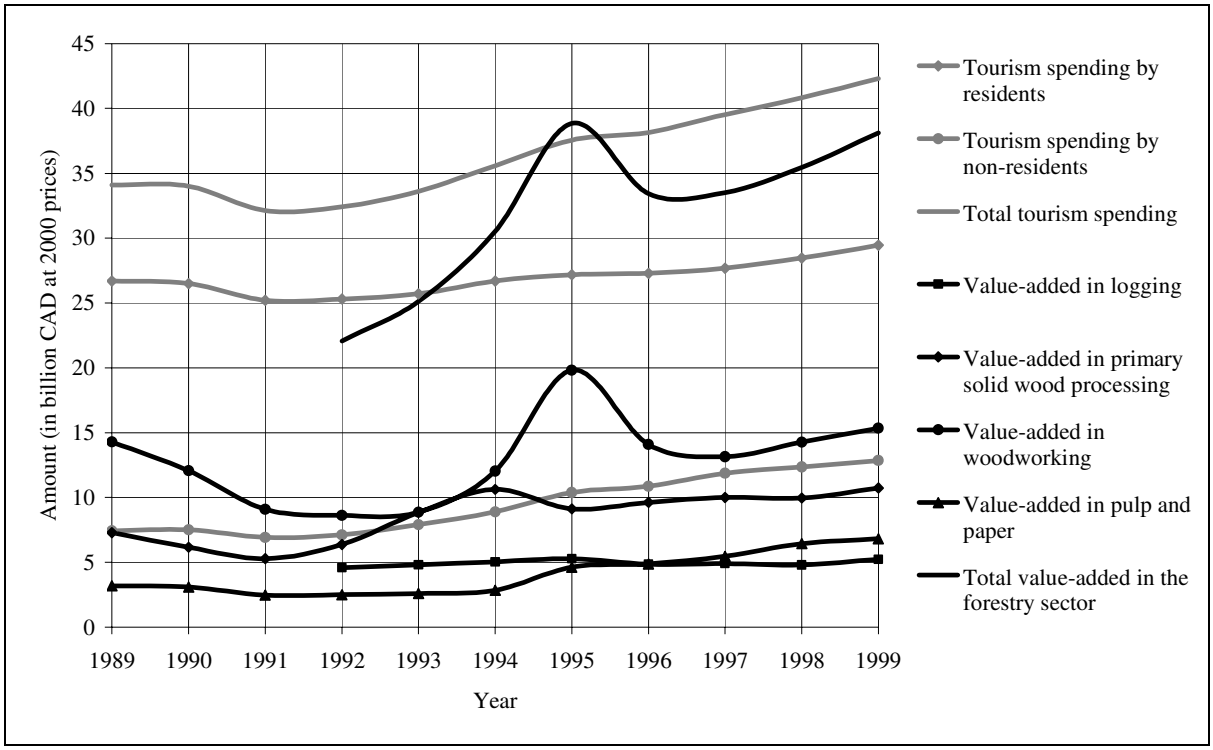
Opportunities to increase the range of goods and services produced by forests

Another opportunity in the future is the possibility of selling recreation and other forest services. Such a development would increase the range of income sources for forest managers and would be more in line with the overall trends in the economies of the GLFA towards greater outputs of services rather than manufactured products.

Forest services comprise a wide range of outputs, including: recreation; carbon storage; watershed protection; and biodiversity conservation. The main problems with trying to raise revenue from these sources are the transactions costs of developing markets and collecting revenue from these outputs. However, out of all of these possibilities, recreation probably offers the greatest potential for future development and a number of other countries (e.g. the

United Kingdom) have already demonstrated that these markets can be successfully developed.

Figure 45 Trends in tourist spending and value-added in the forestry sector in Canada



Source: Value-added - UN National Accounts Statistics and UNIDO; Tourism spending - Statistics Canada.

Taking Canada as an example, Figure 45 shows how the economic importance and value of tourism has developed in recent years compared to the forestry sector. Although the figure shows total tourism spending rather than value-added in the tourism sector, it shows some interesting trends:

- most value-added in the forestry sector comes from woodworking (about 15 billion CAD), in the more common definition of the sector (roundwood, solid wood and pulp and paper products), value-added is only about 20 billion CAD;

- value-added in roundwood production (i.e. the forest management sector) is lowest of all at around 5 billion CAD; and

- excluding the woodworking sector, a comparison between the trends in tourism spending and value-added in the forestry sector would seem to suggest that tourism is probably growing somewhat faster than the forestry sector.

Globally, tourism is the largest sector of the global economy and is one of the sectors experiencing the highest growth rates. In addition, in developed countries, nature-based tourism or ecotourism is also the fastest growing sector of the tourism market. For the GLFA, it also has the advantages of a large market base, some security against foreign competition and could benefit from the huge resource that is available. This is definitely a sector that should be considered in the future by forest managers in the region.

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