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Japan's Forest Production for Increasing Self-sufficiency: A Reassessment of Near-term Capacity and Economic Potential

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Preface

Over the past five decades, Japan has emerged as the world's leading importer of timber. This role as a major importer is of considerable importance to exporters of timber, including the U.S., Canada, The Russian Republics, Malaysia, Indonesia, and more recently New Zealand and Chile. Japan also has significant forests and timber resources, but the management and use of this domestic resource is less well known, particularly among the major exporting countries whose trade with Japan is closely linked to both production and consumption trends. Following major developments in timber markets is an important component of the research program at CINTRAFOR. Recent analysis has documented major trends in Japan's historical trade in timber.[1]

This companion analysis examines the domestic side of the Japanese timber situation, looking critically at the development of Japan's forests and the level of production which can be expected in the near term. Japan has in recent years raised the potential of an "age of domestic timber" —the ability of Japan's expanding plantation forests to sustain an increasing harvest thus meeting an increasing share of domestic demand and reducing the the proportion of consumption met through imports. The present analysis calls into question fundamental assumptions about this "golden age"—not the physical or biological potential of Japan's forests but rather the economic and social factors determining the comparative advantage of Japan as a producer of market timber in the increasingly global marketplace. It is perhaps ironic, but no less significant, that Japan's forests may be increasingly at an economic disadvantage in supplying Japan's timber needs.

This work is the result of field investigations in Japan supported by CINTRAFOR which resulted in an unpublished Master of Arts paper submitted by Mr. Guy Robertson to the Henry M. Jackson School of International Studies at the University of Wshington under the tittle "Japan's

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[1]See "The Development of the Japanese Wood Trade: Historical Perspective and Current Trends," Moffet, Jeffry L. and Thomas R. Waggener, 1992.

Age of Domestic Timber: A Reassessment of the Productive Potential of Japan's Forest Resources" in June, 1991. That analysis has been subsequently expanded and updated through 1991 to the greatest extent possible and is reported in this Working Paper.

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Abstract

This paper presents a reassessment of the productive potential of Japan's forest resources along with a qualified refutation of several recent studies in which Japanese domestic timber production is predicted to rise in the medium to long term. After an examination of the biological dimensions of Japan's forest resources and their relation to the studies being questioned, the main argument of the paper is made, concentrating upon economic and political factors surrounding the Japanese timber industry, factors which we see as presenting a substantial barrier to increased production. Of these, three are examined in depth: 1) rising labor costs which, in conjunction with low labor productivity, have seriously eroded profitability in the forestry sector, 2) the Japanese wood products market which we see as being unable to support increased consumption of domestic wood products at prices which Japanese timber production currently demands, and 3) Changing attitudes within the Japanese populace at large which emphasize alternative forest uses and ecological values over and against timber production. It is concluded that, barring major changes in the world market for wood products, Japanese timber production will most likely continue to decline in spite of a growing stock of harvestable timber. This conclusion has direct implications for timber producers in the U.S. Pacific North West and bears heavily upon the environmental and economic aspects of Japan's participation in the global wood products market.

Executive Summary

Japan's Forest Resources

Japan's forest cover approximately 25 million hectares, or about two thirds of the country's total land mass. Of this, slightly over 10 million hectares consists of man-made forests with coniferous species in relatively young age classes predominating. Most of the remainder is comprised of natural or quasi-natural hardwood forests. Private holders, approximately 90% of whom are individuals possessing less than 20 hectares, dominate the ownership of these forests, holding 65% and 55% of man-made and natural forests respectively. Total growing stock has been calculated at 3.1 billion cubic meters, 1.6 billion of which consist of softwood species in man-made forest plantations. The vast majority of these plantations is comprised of stands of Sugi (Japanese Cedar, *Cryptomeria Japonica*) and Hinoki (Japanese Cypress, *Chamaecyparis obtusa*) which were planted during the 1950s and 1960s under the assumption that they would be intensively managed for timber production, particularly that of high quality lumber for housing.

The Biological Potential of Japan's Man-Made Forests

Though harvests from natural hardwood forests currently account for approximately one third of Japan's total timber production, these harvests are most commonly viewed as a non-renewable resource arising from the conversion of natural forests to softwood plantations. Hardwood production is, if anything, expected to decline, and the hopes of the Japanese for increased timber production in the future lie almost exclusively in the harvest of the country's softwood plantations. Close to 4.7 million hectares of these plantations will reach harvest age between now and the year 2010. The supply potential of this resource, if it were to be managed for maximum biological yield, has been calculated at 65.6 million cubic meters per year, a figure which is well over twice that for current total production, and three times that for current softwood production. Such an increase would be felt

predominantly within the lumber market and other relatively high-priced end-use categories, where the Japanese could virtually eliminate their dependence upon imported softwoods.

Recent Trends in the Ratio of Domestic Production and Imports

Gross domestic consumption of wood products in Japan currently stands at about 110 million cubic meters per year, a figure slightly less than 1974 when consumption reached an all-time high of 116 million cubic meters. Since the 1960s, Japanese domestic timber production has supplied an increasingly smaller proportion of consumption. Imports, on the other hand, made rapid gains in the Japanese market until around 1975 when they began a series of cyclical fluctuations commensurate with total consumption. Domestic production fell from a peak of over 52 million cubic meters in 1967 to slightly over 29 cubic meters in 1990, and now accounts for only 26% of total consumption. Imports, on the other hand, have posted steady gains, rising from 6.3 million cubic meters to 81.8 million million cubic meters in the period from 1960 to 1990.

Recent Supply Projections

No one seriously argues that all of Japan's available softwood plantation stock will actually be harvested. A 1987 study published by the Ministry of Agriculture, Forests and Fisheries (MAFF) has predicted a domestic production rate of 40-43 million cubic meters for 1994 and 45-52 million cubic meters for 2004. This nonetheless implies a more than 43% increase in gross domestic production over the next twelve years and, if projections for demand hold true, would increase the ratio of domestic production to imports from its current level of 26% to over 43%. A study published by the U.S. Department of Commerce International Trade Commission's Office of Forest Products in 1989 also concludes that domestic production will rise, though to a somewhat lesser extent. It predicts a domestic production rate of between 38 and 44 million cubic meters in the year 2000, a figure which

represents 35-40% of the study's predictions for total consumption for that same year.

Neither study provides much analysis or justification for its findings outside of citing an increase in the physical amount of harvestable timber. Available stumpage, however, has been on the rise in recent years, yet domestic production rates have failed to respond. In 1986, only 25% and 32% of the mature stock of Sugi and Hinoki respectively were harvested. Given the fact that in the last few years domestic production has remained stagnant while mature growing stock has continued to increase, it is more than likely that these ratios are even lower today. Moreover, recent increases in consumption have manifested themselves almost exclusively as a rise in imports, and it is becoming more and more difficult to argue that a lack of mature timber is contributing to low rates of domestic production. Instead, it is increasingly apparent that other factors both endemic to Japanese forestry and characteristic of broader changes occurring throughout Japanese society are responsible for the decline of the forestry sector.

Forest Labor

Concurrent with the rapid economic growth enjoyed by Japan throughout the post-war period, Japan's rural areas have experienced a steady out-migration of inhabitants to the industrial and commercial centers of the country's growing urban areas, and securing a stable and relatively inexpensive labor force has become one of the chief problems facing the forestry sector. Whereas nominal wages in the forestry sector have, on average, increased by more than ten times since 1961, stumpage prices have, at best, only doubled or tripled during the same period. When coupled with the labor intensive nature of Japanese forestry and its inability to achieve significant gains in productivity, this relative rise in labor costs has led to a rapid decline in the profitability of forestry. For example, the internal rate of return of Sugi plantations (Japan's most common plantation species) fell from 8.1% in the early 1960s to about 2% in the 1980s, a level well below prevailing interest rates. Similar declines can be seen across the whole of the forestry sector.

In spite of their rapid increase, forest wages are considerably below the national average, and the forest industry has found it more and more difficult to attract new entries into its work force. The result of this has been a rapid decline in the number of forestry workers and a marked increase in their average age. The current number of forestry workers is approximately one fourth of what it was in 1960, and close to 70% of these workers are over 50 years of age, up almost 10% from just five years ago. Given these figures, it is hard to imagine how Japan will economically secure the labor force needed to maintain current levels of production, much less increase them in the future.

Japan's Wood Products Market

Due in part to the high wages and labor intensity associated with Japanese forestry, domestic timber has had to rely upon an increasingly narrow and relatively high priced market niche centered around the production of specialized building materials for traditional housing. Prices for Sugi and, more noticeably, Hinoki have consistently remained higher than those for comparable pieces of Western Hemlock or Douglas Fir. There are several reasons why one might expect this market to be able bear increases in domestic production. Most of these are related Japanese aesthetic preferences and a desire for traditional housing. Nonetheless, traditional construction techniques are extremely expensive, and general trends within the housing market have been moving away from traditional housing to multi-unit structures often made of non-wood materials. Similarly, most of the growth of consumption of wood products in the last three decades has occurred in pulp, wood chips and other lower priced end-uses which cannot be expected to sustain the price premiums upon which domestic timber currently relies. As a result, it is concluded that demand will not be sufficient to support domestic production increases on the order of those cited in the predictions mentioned above.

Forest Policy and Political Trends

Japanese forestry has been and continues to be a highly subsidized industry. The will of the government to continue to pay for forestry programs, therefore, is extremely important in affecting potential production. Timber production, however, is viewed as less and less important by the Japanese people at large, and, like countries elsewhere, competing resource values (most notably those related to recreational use, conservation and watershed management) regarding the use of Japan's forests have gained increasing influence. Calls for environmental conservation are now taken seriously by the central government, and a growing tourist and recreation industry has significantly altered the economic base of many rural communities. As a result, the emphasis previously placed upon timber production by the Japan Forestry Agency has come under increasing criticism, and management concepts stressing environmental amenities and multiple use are gaining increasing influence.

The National Forests

Japan's National Forests cover approximately 7.8 million hectares, or 31% of country's total forest area. Production from these forests in 1990 accounted for 34% of Japan's total timber production, and, as a result, timber operations on the National Forests must be seen as a major component of overall production. The long term ability of the Forest Agency to maintain these rates of harvest on the public lands, however, is extremely doubtful. In violation of the National Forest budget charter, the account for administering these forests is chronically in deficit, with a cumulative debt of over 2.2 trillion yen in 1990, a 48% increase over the 1986 level. Compounding the Forest Agency's problems is the fact that most of the National Forests are located on less accessible and/or less productive sites. Given the budget crisis, the personnel cuts it has engendered, and the relatively poor quality of the National Forest Resource, it is concluded that harvests from the National Forests, if anything, will decline in the future.

Conclusion

In light of the reasons discussed above, it is concluded that Japanese domestic timber production will continue to decline in the years to come. This conclusion assumes generally stable conditions within the global wood products market, an assumption which is certainly open to question but whose analysis is well beyond the scope of the present paper. Japanese forestry enjoys little or no comparative advantage relative to its overseas competitors or to alternative construction materials, and it is believed that prices on the international wood products market would have to rise substantially in order to have any marked effect on domestic production. Japanese timber should remain competitive at the highest end of the wood products market, but the market for other end-uses, including structural timber, should offer increasing opportunities to foreign producers who successfully tailor their products, and their business practices, to the Japanese market. In addition to this, the conclusions made in this paper hold numerous other implications regarding the economic and ecological impacts arising from Japan's position as the world's largest net importer of wood products.

I. Introduction

An almost complete lack of natural resources has often been cited as one of the most salient characteristics of the Japanese archipelago. There is one resource, however, which Japan has in plenty, and that is its forests which total 25 million hectares and cover about two-thirds of the country's land mass. In the 1950s the Japanese embarked on an ambitious reforestation program to rehabilitate their forest resources which had been devastated by over cutting and general neglect during and immediately following World War Two. By the late 1950s much of the cutover area had been replanted, and the emphasis turned increasingly to afforestation.[2] Since that time the Japanese have converted over five and one half million hectares of natural hardwood forest into soft wood plantations.[3] Japan's man-made forests now total approximately 10.2 million hectares, the vast majority of this area being planted in intensively managed stands of softwood species in relatively young age classes. Many of these trees will be reaching harvestable age in the next twenty years, and they represent a potential supply of over 50 million cubic meters of timber to be harvested each year on a sustained yield basis throughout this period.[4]

In light of this fact Japanese foresters and officials within the Japan Forestry Agency have long held that the twentieth century will bring with it an "age of domestic timber" in which a long standing decline of domestic production in relation to imports will be reversed. Though slightly less sanguine about the prospects for Japan's timber industry, some outside observers have voiced similar conclusions, and it is commonly accepted within Japan's wood products industry and elsewhere that production will rise in the near future, though to what extent remains in question.

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[2]For an historical overview of the Japanese forestry sector and its relation to overseas producers in the last century see Moffett, Jeffrey L. and Thomas R. Waggener, 1992.

[3]Calculated from statistics given in Forestry Extension Association of Japan, 1960, and Rinyacho Kanshu, 1992.

[4]Calculated from age structure statistics in Norin Tokei Kyokai, 1989, and yield table in Takahara Shigeru, 1988, p. 102.

This paper argues that, in spite of this vast resource, Japanese domestic forest production will continue to decline in the coming years. The main argument behind this conclusion is that Japanese society as a whole has been and will continue to move in directions which will erode what little comparative advantage Japanese forestry still enjoys relative to overseas producers. The reasons for this are primarily three-fold: 1) rising labor costs and demographic trends will continue to adversely affect Japan's forestry sector; 2) changes in the composition of demand for forest products will give rise to a large discrepancy between the nature of Japan's forest resources and its people's needs, effectively limiting the potential market for the specific wood products for which Japanese timber is best suited; and 3) the political environment surrounding forestry in Japan will continue to change in directions which will work against the production of timber, emphasizing, instead, recreational uses and conservation values. As a result of these three factors, Japanese forestry will face increased competition from foreign producers who enjoy lower labor costs, whose resources are better suited to Japan's needs, and who either do not face the same political constraints or need not rely on government support to the same extent.

Japan is far and above the world's largest net importer of wood products, and the question of whether or not it can substantially increase domestic production is of immediate importance to producers throughout the Pacific Basin and especially to those on the West coast of North America whose products are in close competition with those produced by the Japanese. Additionally, the answer to the question of how much timber Japan will produce in the coming years has direct bearing on the ways in which Japan's forests will be managed. In other words, the nature and health of Japan's forests are also at issue here. And finally, the kind of developments occurring in Japan's forestry sector are not unknown in other industrial countries, and they may also indicate the sort changes which will occur in the forest economies of the developing countries, especially the rapidly developing countries of East Asia.

The conclusions made in this paper have relied on the assumption of generally stable conditions in the global wood products market. There is good

reason to believe, however, that Japan's major overseas suppliers will be reducing harvests in the near future.[5] The potential impact of these reductions on the Japanese market are well beyond the scope of this paper, but it is believed that any price increase resulting from impending shortages would have to be quite substantial to significantly alter our conclusions. Furthermore, potential changes in the Pacific market are unlikely to result in major structural changes in the comparative advantage of Japanese forestry relative to its foreign suppliers. Price increases will mostly benefit more efficient producers overseas and will not reverse the structural decline of the domestic forestry sector.[6]

The paper will be divided into two main sections. The first will provide a brief description of the size and nature of Japan's forest resources, an assessment of the potential market impact of these resources should they be harvested to maximize biological yield, and a discussion of the current situation and recent trends in the Japanese forestry sector and wood products market. This section also includes several recent projections regarding the potential yield of Japan's forests, projections which are much more optimistic than the conclusions presented in this paper.

The second section presents the main argument of the paper, concentrating upon the three points outlined above. Of these, labor undoubtedly constitutes the most pressing and intractable problem facing forestry in Japan and has the greatest influence in determining the productive capacity of Japan's forest resources. In spite of various efforts to increase efficiency, Japanese forestry remains a highly labor intensive industry with levels of labor productivity well below those of most of its foreign competitors. Moreover, wages in the forestry sector have been rising rapidly relative to the price of timber over the last thirty years, seriously eroding the profitability of Japan's forest enterprises. At the same time, demographic trends within the industry and the Japanese populace at large point to an increasingly severe shortage of forestry workers in the coming years. As a result of these factors,

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[5]Perez-Garcia, John M. and Bruce R. Lipple, 1992.

[6]For a discussion of international comparative advantage in the forestry sector see: Lyon, Kenneth S. and Roger A. Sedjo, 1992.

labor has emerged as the single most important element in determining the high price of Japanese timber relative to imports.

Given the high cost of labor inputs in the Japanese forestry sector, domestically produced timber has had to rely more and more upon a narrow and relatively high priced market niche which is concentrated in the construction of traditional style housing. The question posed here is whether this niche can absorb any substantial increase in domestically produced lumber, and, if not, whether the Japanese can find new uses for their timber. In either case the high cost of Japanese forest management should prove to be prohibitive.

The last point considered is the political disposition of the central government and the Japanese people at large toward the forestry sector, and the role they believe Japan's forests should play in the coming years. This question is important for two reasons. First, and most important for the purposes of this paper, forestry in Japan has been and remains a highly subsidized industry, and funding from the Japan Forest Agency and the Public Works Budget profoundly influences the economic equations affecting timber production. In addition, timber operations on Japan's national forests are conducted by the Japan Forest Agency and account for a substantial portion of Japan's overall timber production. In either case, the willingness and ability of the government to continue current levels of forestry expenditure are essential in maintaining present rates of production, much less expanding harvests in the future. Secondly, it is in the political arena that growing concerns held by many Japanese about the environmental and recreational value of their forests are most clearly and forcefully expressed. In recent years many of the assumptions which have guided forest policy in the past have been increasingly questioned by those who envision a different role to be played by Japan's forests, a role which is often directly opposed to timber production.

II. Resource and Market Overview

a) Japan's Forest Resource

Japan's forests cover an area of 25.212 million hectares, with 40% of this area consisting of man-made forest plantations.[7] The rest is most commonly described as natural forests, a classification which includes a large area of hardwood forests which traditionally fell under a coppice management system but are now left largely unmanaged. The ownership of this resource is divided between private holders, municipalities, prefectures and the national government (table 1), with private owners composing the largest single ownership class. Most of the remainder is classified as national forest and is under the jurisdiction of the Japan Forest Agency.

In the last few years the annual increment of growth in Japan's forests has surpassed 100 million cubic meters, a figure roughly equivalent to the country's yearly consumption.[8] Likewise, growing stock has increased from 1.8 billion cubic meters in 1959 to 3.1 billion in 1990, with stocks in man-made forests accounting for nearly 80% of this rise.[9] These forest plantations now occupy some 10 million hectares and constitute approximately 1.4 billion cubic meters of timber, or 47% of Japan's total growing stock. Figures 1 and 2 illustrate the age structure and species composition of these forests respectively. Alongside the obviously large proportion of forest stands in the low to medium age classes, it is important to note that Japan's plantation forests are comprised almost exclusively of softwood species with Sugi (Japanese Cedar, *Cryptomeria Japonica*) and Hinoki (Japanese Cypress, *Chamaecyparis obtusa*) predominating, species which are valued for the high growth rates they exhibit as well as the high quality timber they produce.

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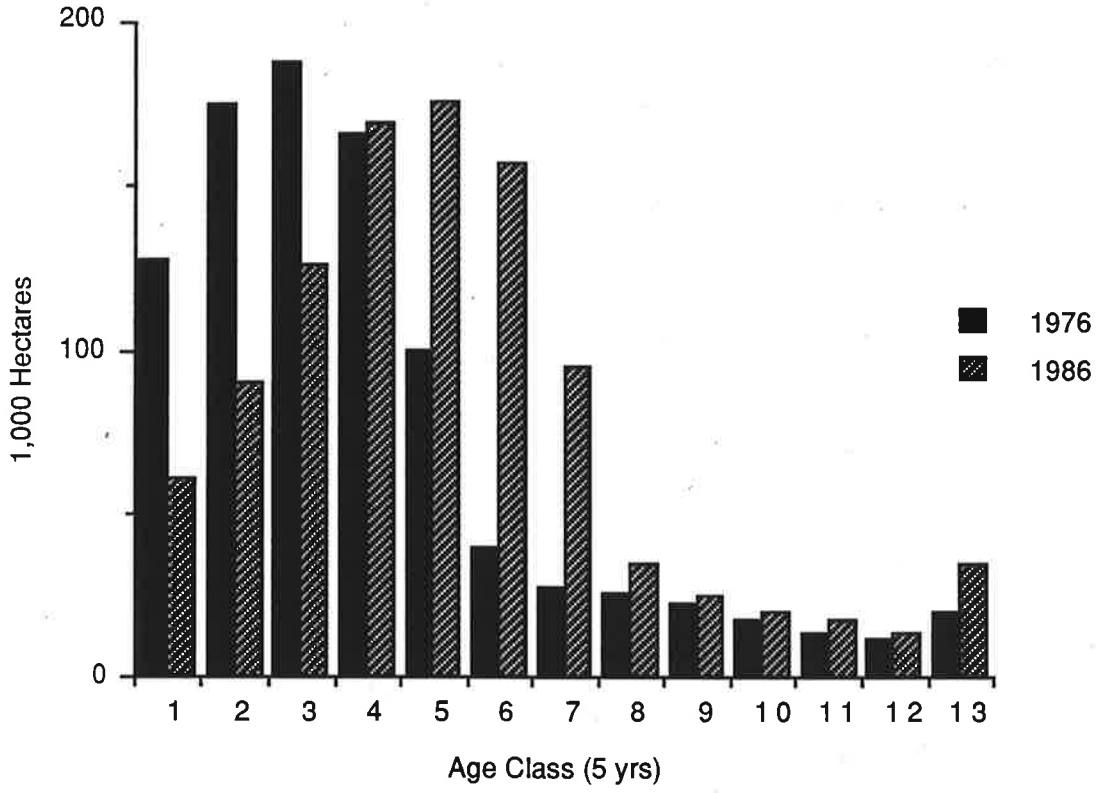
[7]Rinyacho Kanshu, 1992, p. 6.
[8]Kumazaki, Minoru, "Forest Use in Mountainous Areas of Japan," 1989.
[9]1959 statistics from Japan Forest Agency, 1966; 1990 from Rinyacho Kanshu, 1991.

Table 1. Ownership of Japan's Forest Resources

Ownership Class	Total		Man-made		Natural		Cutover Area & other	(million hectares)
Private	14.651	58%	6.673	65%	7.393	55%	0.439	36%
National Forest	7.861	31%	2.466	12%	4.728	35%	0.105	9%
Other	2.7	11%	1.188	24%	1.402	10%	0.666	55%
Total	25.212	100%	10.327	41%	13.523	54%	1.21	5%

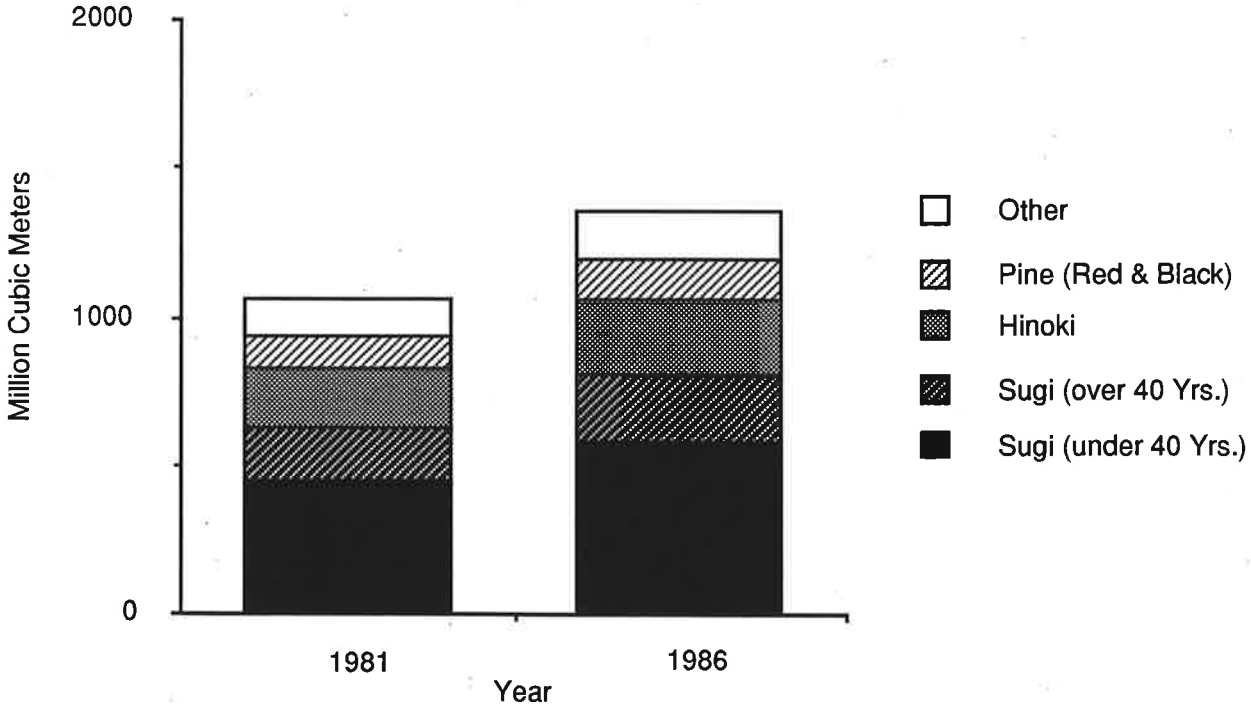
Source: Rinyacho Kanshu, 1992.

Figure 1. Age Structure of Japan's Man-made Forests



Source: Norin Tokei Kyokai, 1989.

Figure 2. Species Composition of Japan's Man-Made Forests



Source: Norin Tokei Kyokai, 1989.

Close to 4.7 million hectares of plantation forests will reach harvest age between now and the year 2010.[10] The supply potential of this resource, if it were to be managed for maximum biological yield, has been calculated at 65.6 million cubic meters per year (measured in log volume assuming an 80% recovery rate from stumpage volume).[11] This would be twice Japan's total production in 1988 and would represent a three-fold increase over current levels of softwood production which have averaged slightly more than 20 million cubic meters throughout the 1980s. Moreover, the primary end use for Japanese softwoods has been high quality lumber for housing construction (table 2), and, with current consumption of lumber totaling approximately 54 million cubic meters, 64% of which is supplied by imports, an increase in softwood production of the magnitude described above would have profound affects upon this market and its overseas suppliers.

Japanese foresters have long looked forward to the coming of age of these softwood plantations, as they represent a considerable investment and were planted with the express purpose of some day being harvested. Indeed, the implementation of a maximum sustained yield system throughout Japan's man-made forests has been a fundamental goal of the Forest Agency since at least the early 1950s, and the high rates of forest conversion since that time must be seen as an effort to expand the area of Japan's forests under permanent commercial management and thereby expand production as a whole. Now that these forests are reaching maturity, the Japanese hope to reap the benefits of their previous efforts, and it is exclusively in these man-made forests that they place their expectations for increased production in the decades to come.

If Japan's softwood plantations were to be managed under a maximum sustained yield system as originally intended by the Forest Agency, these expectations would clearly be justified. There is, however, no reason to expect that it will be economically efficient to harvest all of the trees designated for harvest under such a management system, and the real question here is not

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[10]Figure calculated from age structure data from Kumazaki, Minoru, *Ringyo Keiei Tokuhon*, 1989, p. 232. Standard rotation age for maximum biological yield approximately 45 years on average with variations according to locality.
[11]Takahara Shigeru, 1988.

Table 2. Utilization of Domestically Produced Timber by Species and End-Use (1986)

(Million Cubic Meters)

		Softwood						Hardwood
End-Use	Total	Sub. Tot.	Pine	Sugi	Hinoki	Larch	Other	Total
Total	30.93	20.287	3.12	8.567	3.398	1.571	3.631	10.643
Sawnwood	18.811	16.778	1.701	8.221	3.306	0.999	2.551	2.033
Pulp	1.678	1.497	0.614	0	0	0.86	0.797	0.181
Veneer Board	0.382	0	0	0	0	0	0	0.382
Wood Chips	9.257	1.404	0.681	0.112	0.038	0.375	0.198	7.853
Other	0.802	0.608	0.124	0.234	0.054	0.111	0.085	0.194

Source: Handa ed., 1988 (Appendix). Nihon Ringyo Kyokai, 1991.
Note: Minor categories ommitted.

the magnitude of Japan's biological resource, but how much of this resource is economically available and how large is the political will to influence economics in favor of the forestry sector and thereby increased production as a whole.

b) Future Yield Projections

In order to begin understand the dimensions of Japan's future timber supply potential, this section will consider predictions of future yield made by two different studies. The first is a quantitative projection published by the Ministry of Agriculture, Forests and Fisheries (MAFF) in its "Basic Plan for Forest Resources" adopted in 1987. The second is a more general projection included in a 1989 study by the U.S. Department of Commerce entitled *The Japanese Solid Wood Products Market: Profile and Outlook.*[12]

The MAFF projection for supply and demand of forest products is given along with actual figures for 1984 and 1988 in table 3. In this projection, demand for sawlogs remains relatively stable, while panel products increase by about one quarter and demand for pulpwood increases by about a third, accounting for most of the projected increase in demand over 1984 levels. On the supply side, imports remain stable or even decrease, and domestic production rises along with the ratio of self-sufficiency. Assuming that most of the domestic increase in harvest manifests itself in lumber production and that the demand projections hold true, the market share of domestic sawlogs for lumber could increase from the 1984 rate of 42.6% to anywhere from 65% to 85% by the year 2004.

The MAFF projections, however, deserve scrutiny. Previous versions of the "Basic Plan" have suffered from chronic optimism, and projections for domestic production have been revised downward repeatedly since 1966. Furthermore, the 1987 projections are already seriously off track with actual demand in 1988 exceeding projected demand for 2004 and domestic supply falling (along with the self sufficiency rate) to a level well below the 1984

[12]U.S. Department of Commerce, 1989.

Table 3. MAFF Projections for Supply and Consumption of Important Forest Products (1987)

(Million cubic meters)

		Actual		Projection	
		1984	1990	1994	2004
Demand:	Sawlogs	45	54	43-45	42-45
	Pulpwood	31	41	35	40
	Panel Products	15	15	17	18-19
	Other	4	1	4	4-5
	Total	94	111	99-101	104-108
Supply:	Domestic	35	29	40-43	45-52
	Imports	59	82	58-59	56-59
	Total	94	111	99-101	104-108
Self-Sufficiency (%)		37	26	40-43	43-48

Source: Ministry of Agriculture, Forestry and Fisheries, 1987. 1990 figures from Nihon Ringyo Kyokai, 1991.

figures.[13] In light of these facts, the current "Basic Plan" appears more as an ideal goal for the Forest Agency than as a realistic projection. Nevertheless, it does help to set the upper boundaries of the discussion.

The U.S. Department of Commerce presents a somewhat less optimistic projection in its 1989 study. Assuming per capita wood consumption remains stable along with economic growth and demographic trends, the study predicts a consumption rate of between 110 and 112 million cubic meters by the year 2000, a rise of 7% to 8% over 1987 levels.[14] The study further concludes that:

> "While there is little doubt that domestic log production, which has been on the decline since the late 1960s, will increase in the coming years, any increase in production will, more than likely, be offset by increased demand. It is felt that domestic resources will be able to supply only about 35-40 percent of Japan's forest products needs between now and the year 2000."[15]

Though more conservative than the MAFF report, the supply and demand projections of this study, when combined, yield a domestic consumption rate of anywhere between 38.5 and 44.8 million cubic meters for the year 2000, compared to about 29.3 million cubic meters in 1990. These figures are not that far from those of the MAFF projection, and it is clear that the authors of the Office of Forest Products report have little doubt about the ability of the Japanese to significantly increase their production of domestic timber in the coming years. The report, however, gives little explanation or justification for this conclusion, devoting, instead, most of its chapter on Japan's forest resources to the problems confronting domestic forestry.[16] Furthermore, recent trends, which will be discussed below, also contradict this study's projections.

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[13]See Kurokawa Yasuaki, 1988.
[14]U.S. Department of Commerce, *Opcit.*, P. 31.
[15]Ibid., p. 54.
[16]See Ibid., pp. 43-54.

c) Trends and Current Situation

Though differing somewhat in their resulting forecasts, both of the predictions of future production cited above agree that an increase in domestic production is likely. The arguments for this conclusion rest almost exclusively upon the belief that an increase of mature stands in Japan's softwood plantations will result in greater harvests. The implicit assumption here is that the limited size of Japan's forest resource constitutes a major restraint on harvests and is a primary cause for the decline of domestic production relative to imports. Recent developments in the Japanese forest economy, however, clearly demonstrate that this is not the case. In the following section long range trends within the Japanese forestry sector are examined, and the argument is made that a lack of harvestable trees cannot adequately explain the directions these trends have taken in recent years.

Since the late 1960s the Japanese forestry sector has been in a state of chronic and severe recession. Figure 3 shows changes in the consumption of timber in Japan from 1960 to the present. During this period, imports experienced a ten-fold increase, rising in a somewhat erratic fashion commensurate with demand. Domestic production, on the other hand, has steadily decreased, falling from a peak of over 52 million cubic meters in 1967 to 27.4 in 1991; it is currently at its lowest level since 1950. During this same period, the internal rate of return for forestry has fallen from 8% to 2% (as of 1986).[17] As macro indicators, these two are perhaps the most telling, but many other indicators, from the number of persons employed in the forests to the number of log yarders in use, also show a marked decrease.

Despite large fluctuations in demand, this decline in production was relatively constant during the late 1960s and most of the 1970s, with domestic production falling even in 1973 when demand reached an all time high of 117 million cubic meters. At that time the fall in production was partially construed as the result of a lack of harvestable resources; the high ratio of imports was seen as a temporary phenomenon which would begin to

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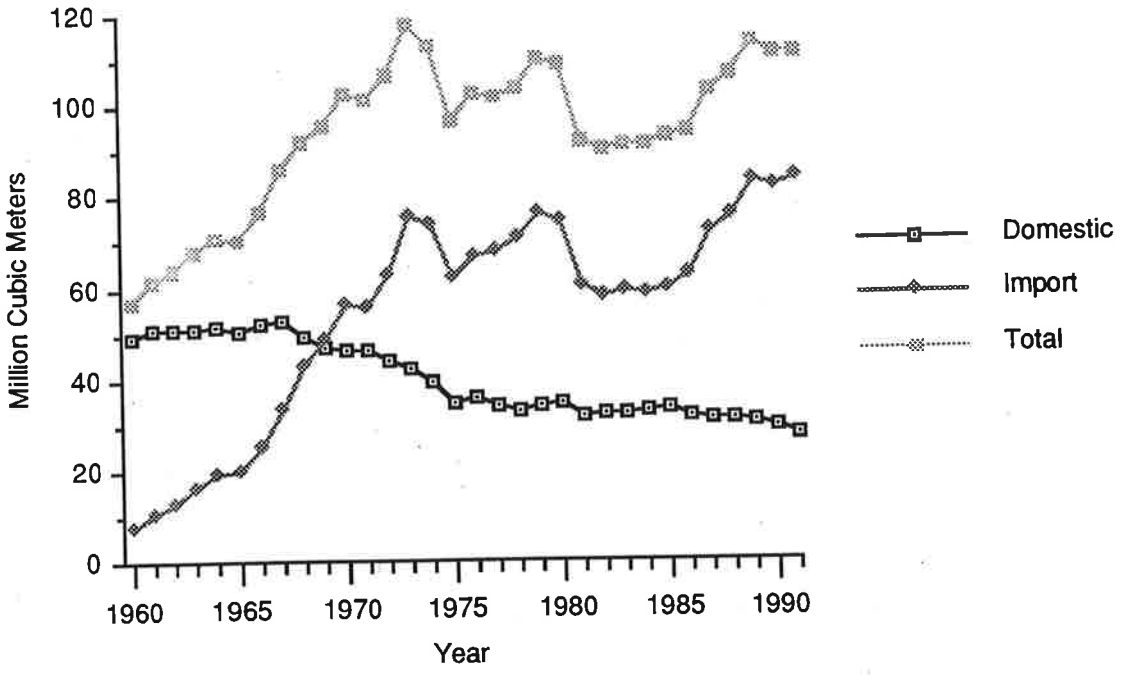
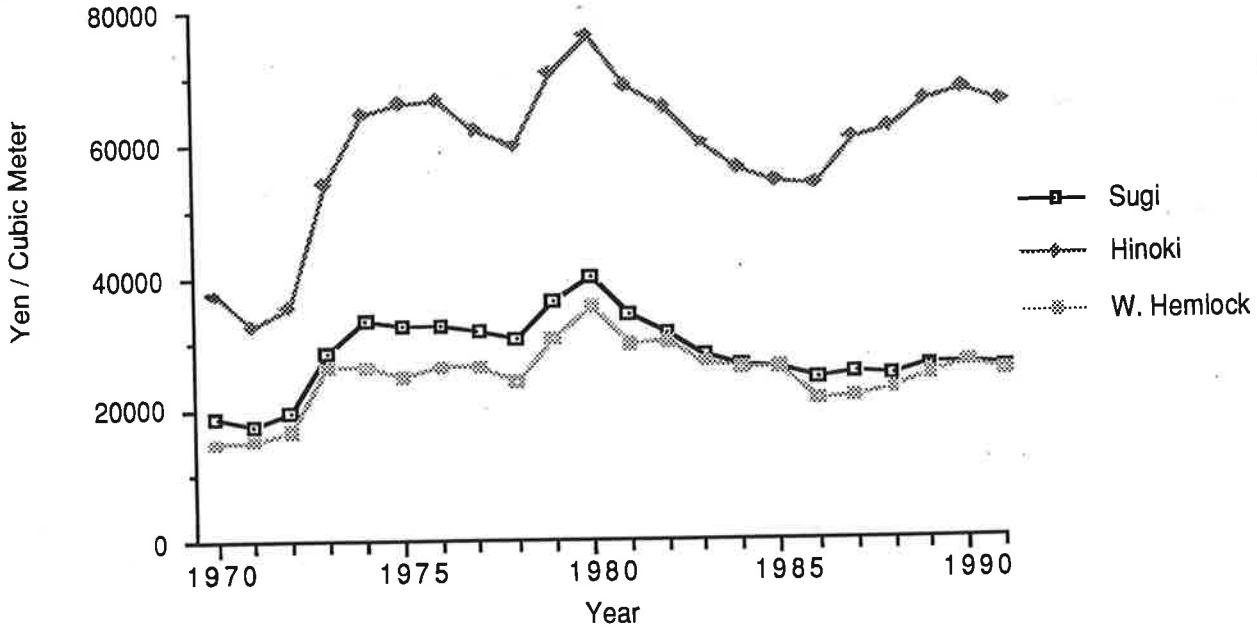
[17]Kumazaki, 1989. Opcit., p. 63.

Figure 3. Consumption of Timber in Japan (1960-1990)



Source: (1960-85) Rinsan Gyosei Kenkyukai, 1990. (1985-90) Japan Lumber J.

Figure 4. Nominal Factory Delivery Prices For Logs (1970-1991)



Source: (1970-82) Handa, ed., 1987. (1982-91) Nihon Ringyo Kyokai, 1991.
Note: Prices for Sugi and Hinoki are for squares of 14-22cm. diameter and 3.65-4 m. length. Prices for Western Hemlock are for squares of over 30 cm. diameter and 6 m. lenght.

disappear when Japan's plantations came of age.[18] The early 1980s brought with them a sharp decline in demand for wood products, however, and cast serious doubts upon Japan's ability to increase the commercial yield of its forests. In spite of increases in harvestable stock, production failed to rise, and it was at this time that Japanese foresters began to see stagnant demand as one of the chief problems they had to face.[19] Demand did rise sharply in 1987 and continued to rise thereafter, but domestic production failed to rise with it, falling instead to a new low of 31 million cubic meters.

One of the causes most often cited for the failure of domestic production to respond to increased demand in the later half of the 1980s is the drastic rise in the value of the yen which occurred during this period. No doubt the yen's revaluation came as a heavy blow to many Japanese producers who saw foreign competition as one of their most onerous problems. In fact, domestic production had experienced slight increases in each of the three years preceding 1987, and it is likely that the yen revaluation helped to reverse this trend. Nevertheless, the effect of the adjustment in the exchange rate should not be overemphasized. As can be seen in figure 4, the rise in the value of the yen had little discernible impact on the price of timber, and, if the revaluation is seen to have any significant effect, it has been to retard the rise in price of species such as Sugi (which are in close competition with foreign products) in the face of increasing demand in the last 5 years; it has not knocked the bottom out of the Japanese wood products market as had been feared by many Japanese producers. In any case, the fundamental disadvantages responsible for the industry's long standing decline were discernible long before this time, as will be argued in the next section, and the adjustment in the exchange rate should not be seen as turning point for Japan's forest industry, but as a development which further exposed the chronic problems faced by that industry. This is all the more apparent if one accepts the belief that the yen revaluation was a realistic adjustment reflecting the strengths of Japan's industries and its new standing in the world economy.

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[18]See supply and demand predictions of 1973 and 1980 "Basic Plan for Forest Resources," in Nomura Isamu, 1986, pp. 57-75. The 1973 plan predicted that domestic production would reach 58.7 mill. cum. by 1991, and the 1980 plan predicted it would be 57.7 by 1996

[19]Japan Forest Agency, 1986, p. 35. This is cited as merely one example of a sentiment found throughout the literature.

One of the most striking characteristics of the trend in domestic production as shown in figure 3 is its lack of fluctuation, especially when seen in contrast to imports which show a strong correlation with changes in total consumption. Furthermore, this fluctuation has been maintained in spite of large changes from year to year in the price of timber (fig. 4). One conclusion that can be drawn here is that the Japanese forest industry is highly insulated from market forces and that its steady decline is a result of structural causes, whether they be resource constraints or otherwise, which are endemic to the industry.

Undoubtedly, the increase of marginally profitable stands associated with the maturation of Japan's forests exerts some influence on production; this may account for Japan's ability to maintain a relatively stable rate of production in face of a rising yen and falling stumpage prices throughout most of the 1980s. But stumpage prices have been on the rise in the last few years, while domestic production has remained stagnant and an increasing number of available forest stands go unharvested. Obviously, the size of Japan's resource base is not the controlling factor here. There are other forces at work, and, though the coming of age of Japan's soft-wood plantations may serve to somewhat mitigate these forces, their intractable nature and the failure of the industry to react to market signals (including among them an increase in marginally profitable stands) calls into question the ability of these increased resources to significantly affect production.

At present, Japanese foresters are only harvesting a small proportion of available man-made timber stands. In 1986 only 25% and 32% of the harvestable stock of Sugi and Hinoki were harvested respectively.[20] Given the fact that in the last few years production has remained stagnant while mature stock has continued to increase, it is more than likely that these ratios are even lower today. Most of this discrepancy is occurring in Japan's private forests (as opposed to the national forests) where harvest rates have consistently fallen below government plans since the late 1960s.[21]

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[20]Takahara, *Opcit.*, p. 88.

[21]See chart in Japan Forest Agency, 1986, p. 38.

There is some question as to whether this behavior represents an abandonment of forest management on the part of private owners or merely an attempt to capture higher prices associated with older timber, especially Hinoki, but most observers see these two factors as reinforcing each other in a time of extremely low profitability. In any case, the end result is much the same; the proportion of harvestable trees is on the rise and government predictions continue to exceed actual production by a wide margin.

One of the most notable characteristics of the Japanese wood products market is the extremely high price garnered by older, high quality timber, and by foregoing harvest foresters are effectively increasing the value of their trees. Age, however, is not the only variable in determining price. Upkeep, in the form of thinning, weeding and pruning, is also a key factor affecting the quality of timber and the overall health and productivity of forest plantations, and this has proved to be a persistent problem for the Japanese. As the most important category in forest upkeep, thinning has received special attention from the government which, beginning in 1981, has subsidized operating costs and road construction at an average rate of 45% in areas where thinning is a priority.[22] Progress has been made in recent years, but it has been estimated that less than three-quarters of the stands in need of thinning were actually thinned in 1986, a figure slightly higher than the 63% of 1983 but still considered inadequate.[23] Furthermore, Sugi and Hinoki plantations usually require two thinnings, one after a stand has reached the age of 25-30 years and a second after 30-35 years of age. As close to half of Japan's plantations are under twenty five years of age, the area in need of thinning will continue to expand in the coming years.

Aggravating this situation is the fact that the Japanese have not been able to find a market for a significant portion of their thinned material, which is subject to high extraction costs and is suitable only for low quality end-uses such as pulp and chip production. In the last few years slightly over half of all thinned logs found their way to market, and in 1988 45% of thinnings, or

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[22]U.S. Department of Commerce, *Opcit.*, p. 53.
[23]*Ibid.*

approximately 2.5 million cubic meters, were left lying in the forest in spite of government subsidies and other efforts to promote utilization.[24] This relatively low level of utilization helps to illustrate the problems the Japanese face in maintaining their forests, and, though it is extremely difficult to quantify the effect of missed thinnings and general neglect upon the overall value of the forest resource, it is certainly significant and will remain a major concern for foresters in the years to come.

Given the persistent failure of the Japanese to harvest a significant portion of their available timber, physical resource constraints can no longer be cited as the major cause underlying decreased production. Other reasons are responsible for the decline in the Japanese forestry sector. In the following section these reasons will be examined and the argument made that there is no cause to expect that the forces working against forestry in Japan will be ameliorated any time in the foreseeable future. On the contrary, it is almost certain that the problems confronting the forestry sector will become more pronounced in the years to come.

[24]See chart in Norin Tokei Kyokai, 1989, p. 74

III. Problems Associated with Forestry in Japan

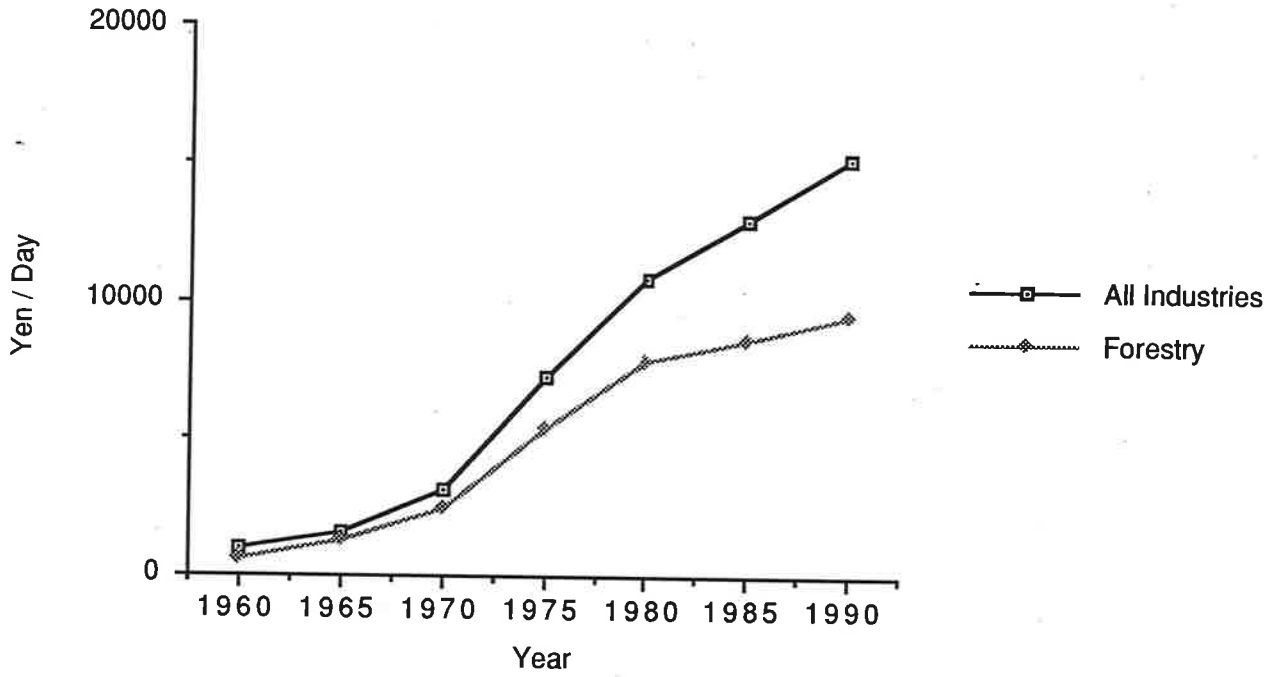
The rapid rise of imports of wood products since the early 1960s clearly illustrates the fundamental problem faced by Japanese forestry; Japanese timber producers cannot compete with overseas suppliers. As stated earlier, the problems associated with labor constitute the single most important cause underlying this inability to compete, and these problems will be considered first.

a) Labor

Concomitant with the high economic growth rate Japan has experienced throughout most of this century, the income of its workers has also seen a significant increase. Real wages for the average Japanese worker have tripled in the last thirty years, and the most important factor allowing for this rise has undoubtedly been the ability of companies in the secondary and tertiary sectors to achieve marked gains in labor productivity through the adoption of new technology and high rates of investment in fixed capital. Japan's high growth industries have been remarkably successful at doing this, and, in spite of the rapid increase of wages, they remain highly competitive in the global market place.

Japan's forestry sector, on the other hand, has not been able to achieve the same results, and the rise in wages the industry must pay its workers has radically altered the economic equations affecting timber production. At the same time, however, wages for forestry workers have not kept pace with the national average (figure 5), and the industry is finding it increasingly difficult to attract new workers who, more and more, are choosing higher paying and arguably more glamorous careers in the high growth industries. As argued below, Japanese forestry can hardly afford pay the wages it does now, and it will be impossible for it to pay for the work force needed to increase production in the future.

Figure 5. Average Daily Cash Earnings for Forestry Workers



Source: Nihon Tokei Nenkan, 1991.

Note: Figures for all industries calculated from monthly salary assuming 5.5 working days / week.

Geography and land ownership patterns constitute the two largest barriers to increased labor productivity in Japan's forests. A country of extremely rugged topography, almost three fourths of Japan is described as being either hill land or mountainous, and nearly half of its total area exists on slopes with a gradient of over 15 degrees. As much of the relatively flat land is used for human habitation, a large proportion of forest lands are situated in steep, relatively inaccessible regions which do not lend themselves to mechanization or large scale management schemes. Adding to this problem is the extremely fragmented ownership structure of Japan's private forests, which comprise over half of the country's total forest area and account for much of its most productive forest stands. Approximately 97% of Japan's private forest owners posses holdings of under 20 hectares with more than half of them owning less than one hectare.[25] The sort of extensive management systems common in North America require, in Japan, the coordination and agreement of many individual land owners and are often impossible to achieve.

As a result of this rugged topography and fragmented ownership, Japanese forestry has been unable to develop the economies of scale enjoyed by its overseas competitors and has remained a highly labor intensive industry. This problem is compounded by the fact that almost 70% of softwood plantations are planted in Sugi and Hinoki, species which require a great deal of silvicultural effort to raise.[26] It takes about 130 days of labor to raise a hectare of either of these species to harvestable age, a figure anywhere from two and a half to five times higher than that for other softwood species planted in Japan and close to ten times that for Western Hemlock grown in the Pacific Northwest.[27] These high labor intensities are also apparent in the areas of lumbering and transportation from forest to mill.

When combined with rapidly rising labor costs, the high labor intensity of Japanese forestry has had a devastating effect on the industry. Table 4 describes changes in the profitability of Sugi plantations during the last thirty

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[25]U.S. Department of Commerce, *Opcit.*, p. 46.
[26]Japan Forestry Technical Association, 1987, (in Takahara, p. 31).
[27]MAFF Dept. of Statistics 1988. Actual figures are: Sugi-141.9 days; Hinoki-128.4; Pine-48.2; Larch-21.3; Fir/Spr-27 (1986 nationwide average).

Table 4. Profitability of Sugi Plantations (1961-1986)

Year	Stumpage Price yen/cubic meter (A)	Wage Rate yen/day (B)	Price/Wage (A/B)	Final Harvest Revenue 1,000 yen/ha.	Establishment Cost 1,000 yen/ha.	Internal Rate of Return (%)
1961	9,081	516	17.6	2,724	133	8.1
1966	9,757	1,019	9.6	2,927	265	6.5
1971	12,040	2,011	6.0	3,612	519	5.3
1976	19,580	4,557	4.3	5,874	1,309	4.2
1981	20,214	6,609	3.1	6,604	2,203	2.8
1986	14,144	7,268	2.0	4,243	1,980	2.0

Source: Kumazaki, 1988.

Assumptions: 1) rotation period is 45 years; 2) yield is 300 cubic meters/ha.; 3) revenue is 300 X A (revenue from thinning is neglected).

years. Though the numbers may differ in the case of other species, the same trends are reflected throughout the industry. The most notable changes are found in the areas of wages and establishment costs (the costs incurred in raising a hectare of timber to a harvest age of 45 years). Both of these categories demonstrate a fourteen-fold increase during the period in question, and, whereas in 1961 establishment costs comprised only 5% of final harvest revenue, in 1986 they accounted for fully 47% of this revenue. Furthermore, it should be noted here that labor costs are far and away the largest category of expenditure in establishment costs, accounting for over half of these costs in the case of both Sugi and Hinoki.[28]

This rise in the cost of labor inputs has, in turn, been reflected in the internal rate of return for forestry, which, in the case of Sugi, has fallen to a current low of 2%, a level at which it would be far more profitable to abandon forest management altogether and invest one's money elsewhere. In most instances, however, the decision to invest in forestry was made years ago when profitability was considerably higher, and many producers are no doubt staying in the business in order to retrieve whatever they can on their initial investments. Nevertheless, on a vast majority of Japan's forest lands replanting is mandated by law, and a forest owner who chooses to harvest subsequently incurs the substantial costs associated with planting another stand and beginning the management cycle all over again. In light of this fact, it is certainly understandable that many of Japan's private forest owners choose to forego harvest of their mature stands, and it seems unlikely that a significant number of them will choose to do otherwise in the future:

> "It is no wonder that the majority of the private forest owners are reluctant to harvest their timber and replant. The clear cutting of a Sugi stand 40 to 50 years old might only give the owner a very small amount of income if re-establishment costs are subtracted. . .The traditional labor intensive systems of management, developed when labor was cheap and timber dear, have now apparently collapsed."[29]

Even if private forest owners did decide to harvest their trees in sufficient number to justify the projections considered in the previous section, it is

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[28]MAFF, Department of Statistics, 1988.

[29]Kumazaki Minoru, "Japanese Economic Development and Forestry," 1988,. p. 12.

extremely unlikely that the industry could obtain the labor necessary to make these harvests possible. As was illustrated in figure 5, wages in the forestry sector will have to increase considerably if they are to compete with the national average, and, furthermore, the pool of workers who could respond to such an increase has been shrinking rapidly in recent decades and will continue to do so in the future.

Japan's silvicultural practices, and a majority of the forest stands now reaching harvest age, were established at a time when silvicultural labor was relatively abundant. This situation, however, has changed drastically in the last few decades. Concomitant with its high rate of economic growth in the postwar period, Japan has, and continues to experience a high rate of urbanization accompanied by a major shift of its work force from the primary industries to the secondary and, more recently, the tertiary industries. Consequently, Japan's mountain villages are stagnating economically, their populations are in rapid decline, and the labor surplus formerly enjoyed by the forest industry has evaporated. From Hokkaido and Tohoku to the major timber producing regions of Shikoku and Kyushu, rural prefectures have experienced a steady out-migration of their inhabitants to the major urban areas centered around Tokyo and Osaka. Moreover, most of this migration from country to city has been undertaken by young adults seeking higher education or employment in the high growth industries.

As a result, the number of new entrants into the work force of the primary sector has rapidly declined. In 1970 approximately 32,000 high school graduates found employment in the category of agriculture, forestry, and fisheries. By 1988, that number had fallen to slightly over 4,000.[30] In the forestry sector, this demographic trend has manifested itself in a steady decline in the number of forest workers and a rapid increase in their average age (figures 6 and 7). Approximately 69% of forestry workers are now over the age of fifty, and, at 43.8, the average age of workers in the lumber and wood products industry as a whole is the highest of any category listed in a recent Ministry of Labor survey.[31] As the average age of these workers

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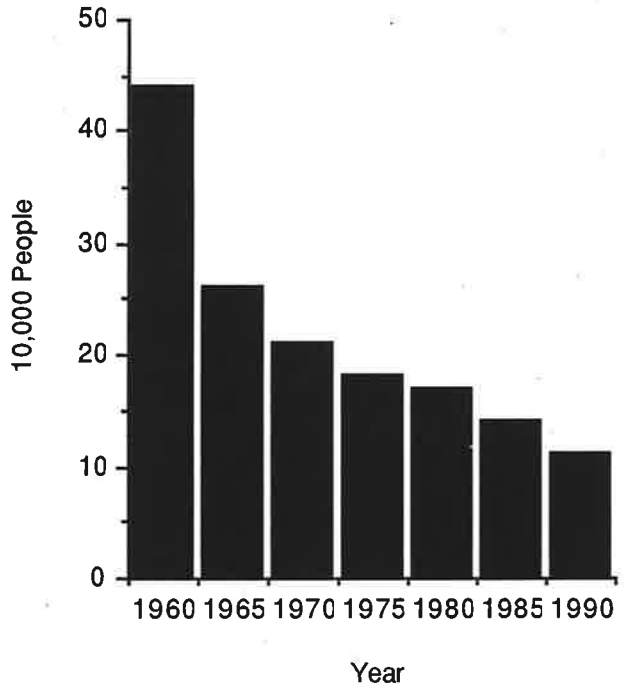
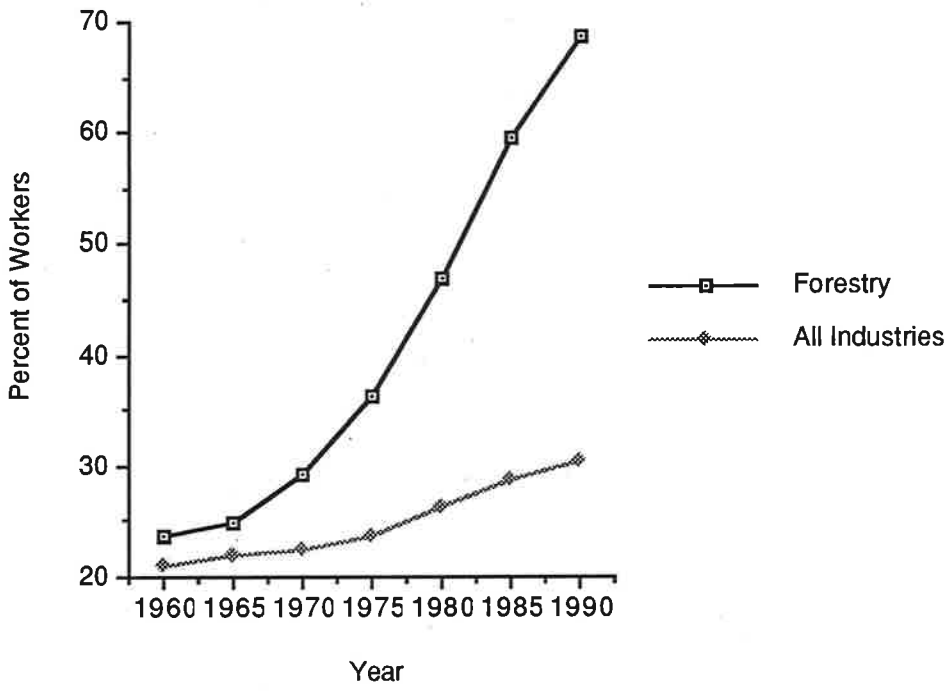
[30] *Nihon Tokei Nenkan*, p. 90.
[31] *Ibid.*, p. 96.

Figure 6. Number of Foerstry Workers, 1990-1985



Source: Nihon Ringyo Kyokai, 1991

Figure 7. Percent of Forestry Workers Over the Age of 50 Years (1965-1990)



Source: Nihon Ringyo Kyokai, 1991.

continues to increase, the number of retirees can also be expected to rise, and, with fewer and fewer new workers entering the work force each year, the ability of the Japanese to supply enough labor to maintain current levels of harvest, much less expand them, seems very much in doubt.

A final consideration is that Japan, like the countries of Western Europe, has experienced decreased fertility and a rapidly aging population in recent decades. With the age of the average worker increasing from 30.9 in 1960 to 37.9 in 1987, the question of who will provide the labor for Japan's expanding economy has become a matter of great concern in the last few years. New entries into the work force are currently in decline and, with a nation wide labor shortage already looming in the immediate future, Japan cannot afford to divert workers from its highly productive growth industries to forestry. Furthermore, even if the profitability of forestry did increase to the point where it could offer competitive wages, the assumption that labor will be sufficiently mobile to take advantage of this increase deserves a great deal of scrutiny given the types of skills and experience a growing majority of Japanese workers possess.

In the final analysis, labor has become an increasingly precious resource in Japan, and it is now unfeasible to waste it in an industry like forestry which exhibits such low productivity. This fact is clearly demonstrated by the industry's inability to afford its current labor costs, much less pay the sufficient wages to secure a labor force for the future.

b) End-Use Markets

Though the high labor intensity of Japan's Sugi and Hinoki plantations is proving to be a major weak point within the forest industry, these trees were planted for good reasons. Both species, particularly Sugi, exhibit a high rate of growth, both possess excellent aesthetic and structural characteristics, and both command high prices in the market place. This is especially so for Hinoki, which often sells for more than twice the price of other softwood species. Given the high cost of labor inputs associated with these species, however, it is only at these prices that they can begin to be economically

viable, and for this reason Japan's most common plantation species must be seen as occupying a rather specific and high priced market niche. The question is, given changes in consumption patterns, whether this niche can support a significant increase in lumber produced from Japan's Sugi and Hinoki plantations. This issue is considered in the following section.

There are several reasons to expect an increased demand in the near future for the sort of high priced timber Japan's forests produce. Much of this has to do with a combination of traditional tastes in housing and a growing number of people reaching the age at which the purchase of a home becomes a major concern. The Japanese home building industry has consistently used 75% or more of Japan's total domestic supply over the last twenty years, the vast majority of this wood going into the construction of traditional post and beam dwellings.[32] Furthermore, post and beam construction has experienced a slight resurgence in recent years after declining throughout the 1970s and early 1980s, and in a recent Japanese poll 73% of those surveyed said they preferred wooden homes of traditional construction over other construction methods and non-wooden structures.[33] These homes comprise the principal end-use for lumber produced from Sugi and Hinoki, and, though Pacific Northwest old-growth timber has been used in this category in the past, it is doubtful that it will continue to be used to the same extent given recent moves to restrict the cutting of old-growth and the potential expansion of whole log export bans in the U.S..

The Japanese have been willing in the past to pay extremely high prices for specific kinds of lumber. Certain decorative pieces such as the post used in the traditional alcove, or *tokonoma,* often fetch prices of over 10,000 dollars for a single eight foot post. This is especially so if the lumber comes from one of the long famous producing regions in Kansai and Northern Kyushu. Such lumber is associated with a well known name and carries with it a considerable reputation and worth as a status symbol. With affluence and consumerism on the rise in Japan, it is quite possible that an increasing

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[32]U.S. Department of Commerce, *Opcit.*, calculated from table on p. 36.
[33]*Japan Lumber Journal,* 31:17, (Sept. 22, 1990).

number of people will be willing to pay the price for homes constructed in the traditional manner using domestic timber.

There are, however, strong economic incentives to do otherwise, and long term housing trends are moving in the opposite direction. Like Japanese forestry, traditional post and beam construction is a highly labor intensive affair utilizing a wide array of nonstandard lumber pieces and requiring carpentry skills which, more and more, are in short supply. As a result, post and beam construction is no longer cost competitive with more rational and capital intensive methods. For example, it has been estimated that a 1,800 square foot home constructed by Western 2X4 platform methods cost at least $180,000 (excluding land costs) to build in Japan compared to $250,000 or more for a traditional home of comparable size.[34] Another factor to be mentioned here is the extremely high land prices in Japan which make the purchase of a private home a virtual impossibility for many Japanese. As a partial result of these two factors, housing starts using post and beam construction methods dropped by over 35% between 1970 and 1988 (table 5), and a rapidly increasing number of Japanese took up residence in apartment buildings. As of 1988, 59% of all housing starts were in multi-unit structures (up from 44.3% in 1983), and only 15% of these used wood as their primary material.[35] The number of starts of prefabricated units and houses of 2X4 platform construction, on the other hand, have been on the rise. This is especially so for 2X4 construction which, though comprising only a small percentage of total wooden housing starts, has increased every year since its introduction in 1974 in spite of wide fluctuations in the housing market. It should be noted that 2X4 housing uses U.S. lumber almost exclusively and that U.S. producers are reporting increased imports to the prefabricated housing market as well.

Japan's traditional post and beam construction suffers from much the same problems as does its forest industry; it is a labor intensive industry in an increasingly capital intensive world. Given the increasing shortage of skilled carpenters knowledgeable in traditional methods and an overall labor shortage throughout Japanese society, the price gap between traditional

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[34]U.S. Department of Commerce, *Opcit.*, p. 26.
[35]Rinsan Gyosei Kenkyukai, 1990, p.288.

Table 5. Housing Starts in Japan (1970-1991)

Year	Total Units		Type of Construction			
	Wood	Non-Wood	Wood 2X4	Wood Post & Beam	Prefabricated Units	
					Total	Wood
1970	1,035,500	449,056	0	1,009,000	140000(1)	27,000
1975	907,389	448,897	2,152	879,000	143,000	25,000
1980	750,953	517,973	13,003	712,000	124,000	26,000
1985	591,911	644,161	24,095	524,000	180,000	44,000
1986	648,966	750,867	31,708	562,000	211,000	55,000
1987	741,552	932,748	40,105	635,000	247,000	66,000
1988	697,267	987,377	41,493	606,777(1)	251,200	71,600
1989	719,870	942,742	47,572	592,798(1)	258,800	79,500
1990	727,765	979,344	51,093	590,972(1)	270,300	85,700
1991	624,003	746,123	NA	NA	NA	NA

Source: Rinsan Gyosei KenkyuKai, 1991. Nihon Ringyo Kyokai, 1991. Keishohin Joho, June, 1992.

(1) = Estimated from other figures in table.

NA = Not Available

housing and alternative methods can be expected to increase. Consequently, a house of post and beam construction will be considered more and more as something of a luxury item, one which the Japanese can increasingly afford, but which, nonetheless, must face strong competition from more economical methods using alternate materials. Furthermore, it should not be assumed that Japanese timber will necessarily find itself a market in alternative housing; by using standardized specifications, these methods are more open to competition from overseas producers, and, by using lumber primarily for structural purposes, these methods tend to exhibit much less exposed wood, thus negating domestic wood's aesthetic advantage and robbing it of a major rationale for its high price relative to imports.

In comparison to the housing market, general trends in the relationship between Japan's overall consumption of wood products and domestic timber production are far more clear. Trends for domestic and total wood consumption by end use are given in table 6. Though demand does fluctuate widely in the period considered, that for wood pulp and chips, and that for veneer board both doubled since 1965 while demand for lumber is currently only slightly higher than its 1965 level. Likewise, it should be noted that, while the MAFF projection considered in section I predicts stable or even decreasing demand for sawlogs over 1984 levels, it predicts a 29% increase for pulp and wood chips and a 20-26% rise in demand for veneer board (which is used primarily for the production of *kon-pan*, or panels for concrete forming). Both consumption of pulpwood, which has come to be seen as a major economic indicator, and that of veneer board are integrally linked with the growth of Japan's modern economy, and, though increased efficiency through recycling is possible (particularly in the area of concrete forming panels), the MAFF projections seem realistic in this area.

Trying to access these growing markets for wood fiber and veneer board as an outlet for domestic production has been a perennial concern for the Forest Agency. This is understandable given the fact that the utilization of domestic timber in these categories has fallen steadily over the years. It should be noted, however, that close to 85% of the domestic supply of pulp and wood chips, and all of that for veneer board, is produced from Japan's natural hardwood forests and is essentially a non-renewable resource obtained in the

Table 6. Consumption and Domestic Production by End-Use (1960-1990)

(million cubic meters)

	Total		Sawlogs		Pulpwood		Veneer Board	
Year	Total	Domestic	Total	Domestic	Total	Domestic	Total	Domestic
1965	79.798	50.375	47.084	34.124	14.335	11.204	5.187	0.618
1970	105.027	46.241	62.009	27.362	24.887	14.846	13.059	0.778
1975	97.501	34.577	55.341	20.961	27.298	11.021	11.173	0.620
1980	110.723	34.557	56.713	20.953	35.868	11.280	12.840	0.541
1985	92.901	33.074	44.539	18.814	32.915	12.844	11.217	0.433
1986	94.506	31.613	44.933	18.397	33.558	11.878	10.942	0.404
1987	103.136	30.984	47.937	18.774	34.671	11.005	13.463	0.395
1988	106.282	30.998	53.681	18.811	38.265	11.003	13.02	0.382
1989	113.850	30.586	55.481	18.553	42.313	10.965	14.703	0.381
1990	111.160	29.367	53.887	18.023	41.344	10.373	14.516	0.354

Source: 1960-1980, Handa ed., 1988, Appendix. (1985-1990) Nihon Ringyo Kyokai, 1991.

Note: Minor categories ommitted.

process of conversion to softwood plantations. As such, it has little place in Japan's plans for the future of its timber industry. Any hope for an increase in the domestic supply of wood pulp and chips lies in the ability of the Japanese to utilize thinnings and marginal trees of larch and pine from softwood plantations. That they are having little success in this area is evident from persistent declines in the utilization of domestic wood in these sectors in spite of increased thinnings in recent years, and it is all the more clear when one remembers that almost half of Japan's thinned trees are left to rot where they fall.

Sugi and Hinoki were originally planted because of their superior characteristics and the high prices they commanded in the domestic market place. However, general trends in wood consumption both in Japan and throughout the world have been moving in the opposite direction, favoring cheaper timber and substitute materials, and, as a result, Japan's forests are severely limited in the sorts of uses they can be expected to serve. Traditional housing is the only major market in which domestic timber can compete, and its ability to do so, as well as the size of the market itself, relies heavily upon the willingness of consumers to pay a much higher price than they would for comparable alternatives. Due to the high labor intensity of traditional construction, this disparity can be expected to rise. Though it may fluctuate widely, the market for domestically produced timber cannot be expected to exhibit dynamic or sustained growth. It is more likely that, in the long term, it will continue to lose out to more efficient materials and methods. At current prices Japanese forestry is, at best, only marginally profitable. An increased harvest of Japan's Sugi and Hinoki plantations would have the effect of flooding the market with expensive timber, and it is doubtful that the price would hold. This is especially so when one remembers that many of Japan's private forest owners are currently foregoing harvest in the hope of capturing the higher price associated with older trees, and are thus increasing the reliance of forest production as a whole upon a specialized and narrow market niche.

c) Political Trends

The above consideration of the forestry sector has centered upon the resource base and the immediate production and market factors affecting forestry in Japan. However, given the fact that Japanese forestry enjoys one of the highest rates of government subsidy for forestry in the world[36] (mostly in the form of subsidies and low cost loans to private producers as well as loans from the government's general accounts to cover deficits in the Forest Agency's budget), the political disposition of the central government in regard to forestry cannot be ignored in the assessment of the productive potential of Japan's forests. Here, two questions are considered in turn: 1) what are the goals of forest policy, and 2) how likely is it that current rates of subsidy for the forestry sector will be maintained in the future?

Since the eighteenth century, the Japanese have deemed it necessary to provide political measures aimed at controlling and directing the exploitation of forest resources.[37] The primary reasons for this were, historically, the protection of watersheds essential to Japan's rice based agriculture and the assurance of a relatively stable supply of wood for construction in Japan's growing urban centers. Though they have evolved somewhat to meet the conditions of Japan's contemporary society, these two considerations have remained as primary concerns in shaping forest policy in the post-war period. Additionally, the need to provide for the economic welfare of rural Japan in the face of rapid industrialization and urbanization has made the economic stimulation of forest regions another major force in the formulation of forest policy. This need has become especially acute since the early 1970s when the forest industries entered the chronic recession which continues today. Accordingly, these three factors (self sufficient supply, environmental quality, and the welfare of forest communities) have become the corner stones of forest policy in the second half of the twentieth century.[38]

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[36]Hideao Akai, 1992-1993, (No. 366)

[37]See introduction in Totman, 1989.

[38]A relatively early formulation of these priorities can be found in the Japan Forest Agency, 1966, p. 24. For a more explicit enumeration of policy objectives see Handa Ryoichi, "Timber Economy and Forest Policy After the World War II [sic]," 1988. pp. 22-35.

Given these three priorities, the question of how they are balanced becomes a major concern in determining the potential effect of current political developments on wood production. In the post-war period, Japanese forestry has enjoyed an ever increasing amount of subsidy provided primarily by expenditures from the public works fund of the government's general account.[39] Annual expenditures of the Forest Agency (excluding the National Forest Special Business Account) totaled some 360 billion yen in 1985, as compared to 7.5 billion yen in 1950. Throughout this period, soil conservation has consistently maintained a share slightly under half of total expenditures. The remainder is divided mostly between subsidies for silviculture and road construction with the latter being emphasized.[40] What is surprising here is that, in spite a marked decrease in planting and the overall size of the industry since the late 1960s, the distribution of funds between the various categories of expenditure has remained relatively stable, and the total amount of subsidy has greatly increased during this same period. Government funding of the forestry sector, it would appear, has been subject to drastically diminished returns.

The large proportion of government funds devoted to soil conservation is not surprising. Given Japan's steep topography, highly erodible soil, and concentration of population on the flood plains of rivers originating in nearby mountain ranges, soil conservation is of fundamental concern. Since the conversion of vast areas of natural forests to plantations has made human intervention increasingly important in regions where natural watersheds have been largely disrupted, this is even more the case today. As a result, soil conservation should be considered as something of a fixed cost which the government cannot afford to ignore without heavy risk to life and property.

Silviculture and road construction, on the other hand, allow for a higher degree of flexibility, and, as such, are more malleable to the policy concerns of the times. Until the 1970s, both the development of forest roads and silvicultural subsidies were primarily aimed at increasing the reforestation of

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[39]Expenditures in the National Forest Business Account comprise a separate though important category which will be treated latter.
[40]See table in Handa, ed., *Opcit.*, p. 417.

Japan's depleted resource base and, later, the conversion of natural hardwood stands to softwood plantations. During this period, subsidies for reforestation ranged from 30% to 70% and those for afforestation (conversion to plantation) rose as high as 80%. Likewise, subsidies for road construction averaged over 50%.[41] At the time, these expenditures were justified mainly in relation to increased production and, later, the stimulation of rural economies.

The 1970s and 1980s, however, brought with them changes in both public opinion (to be discussed later) and the nature of Japan's forest resource, and forest policy, especially that related to silviculture, began to shift slowly but surely.[42] Beginning in 1969, subsidies for reforestation were reduced and subsequently phased out in 1971. In the following years, the upkeep of softwood plantations became a major concern, and subsidies for forest land improvement and thinning were established first in 1973 and latter expanded in 1981 and 1987. Likewise, in 1977 subsidies were expanded for the construction of roads in areas in urgent need of thinning, further reflecting the necessity of addressing the quality of forest resources as opposed to their quantity alone. The structure of subsidies for road construction has remained relatively unchanged since that time, but it should be remembered that forest roads can be seen to serve various uses not directly related to timber production, conservation and recreation being among them.

In line with a growing disillusionment in the economic and ecological viability of the single-storey, clear cut management system, a subsidy was established in 1984 and further expanded 1986 to promote multi-storey silvicultural systems and the partial management of natural forests. This move was seen to "reflect the recent tendency of Japan's silvicultural policy,"[43] and has become a key project for many Japanese foresters.[44] Though

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[41]For a more detailed outline of subsidies for these categories see Ryoichi Handa, "Subsidies on Forestry," in Handa, *Ibid.*, pp. 416-22.

[42]Figures for this paragraph culled from *Ibid.*

[43]*Ibid.*, p. 418.

[44]Interview with Dr. Takeo Fujimori, Director of Silviculture Section, Forestry and Forest Products Research Institute, Ibaraki, Japan, July 18, 1990. Dr. Fujimori sees the establishment of multi-story forests using a selective cutting system as a major goal to be achieved by forest policy in the coming decade.

multi-storey and managed natural stand systems comprise a relatively small proportion of Japan's forests resources (880,000 ha. and 2.49 mill. ha. respectively), their share has been increasing in recent years, and it can be assumed that they will continue to do so in the future.[45] These schemes have the advantage of being environmentally friendly and less labor intensive, as replanting is unnecessary. However, they are not conducive to the sort of high yield production Japanese foresters had previously envisioned for their forest plantations. Moreover, they represent a competing philosophy regarding forest management and a shift from an emphasis upon gross volume production to a less intensive management system which the proponents of these new management systems believe is more in line with the realities of Japan's forest economy. In other words, they signify a qualified retreat from plantation forestry and the "age of domestic timber."[46]

In spite of the enthusiasm of their adherents, however, these new silvicultural systems have yet to gain wide spread currency throughout Japan's forestry establishment. More traditional approaches to forest management which place a heavy emphasis on maximizing physical yields continue to exert a strong influence on forest policy. For example, subsidies for conversion of natural stands were maintained until 1987 in line with the Forest Agency's long held goal of converting approximately half of Japan's forests to softwood plantations.[47] Nonetheless, this policy does not necessarily bode well for the increased production of timber in Japan. Quite understandably, conversion was first undertaken in those areas which displayed the most economic potential, and, as the government continued its afforestation program into the 1970s and 1980s, it had to look to increasingly remote and economically marginal areas. As noted above, conversion to managed forests entails on-going costs associated with maintenance and soil conservation. Given the problems Japan is experiencing in even its most profitable forest regions, it is doubtful that the plantations created in recent years should be seen as a resource asset so much as a liability which will compete with other priorities in an already strained fiscal environment.

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[45]See table on page 5 of Nihon Tokei Nenkan, *Opcit.*

[46]For a more detailed description of these alternate management schemes see: Ringyo to Shizen Hogo Mondai Kenkyukai, 1989.

[47]Handa, *Opcit.*, p. 419.

Together with the directions promoted by forest policy, the additional political question of whether or not the Forest Agency and forest constituents can hope to maintain the expanding levels of funding they have enjoyed in the past is of crucial importance. The answer to this question lies mostly in the disposition of public opinion and the number and strength of the allies the Forest Agency can rally around its causes. In either case, the outlook for the Forest Agency is not promising.

In recent years public opinion regarding the appropriate use of Japan's forest lands has changed dramatically. In an opinion poll carried out by the Prime Minister's Office in 1986, respondents were asked to choose three out of seven functions performed by forests which they believed would be important in the future. Whereas 70% mentioned erosion and flood control, 49% mentioned water retention and 36.6% mentioned mitigation of air and noise pollution, only 33% mentioned timber production, fully 22 percentage points lower than the 55% who felt timber production to be important in a similar poll conducted in 1980.[48] This trend is similar to that occurring in other industrialized nations where the environmental and recreational value of forests is increasingly emphasized by urban populations who see little or no connection between forest production and their economic well being, and it certainly can be expected to continue in Japan where the primary industries comprise an ever smaller portion of the gross national product. In the words of one Japanese observer, Minoru Kumazaki:

> "The timber-nontimber balance is undoubtedly shifting in the favor of nontimber. Many people want more natural forests rather than artificial ones. . . Foresters sometimes found themselves accused of destructive cutting, persistence in conifer monoculture, disregard of aesthetics, neglect of wildlife, and so on."[49]

In accordance with this shift, the Forest Agency has had to modify many of its practices and regulations. The above mentioned alternative management systems in many ways reflect this shift as do more stringent restrictions on

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[48]Kumazaki Minoru, "Forest Resource Use and Conservation in Japan," 1988, pp. 110-12.
[49]*Ibid.*, pp. 110-11.

the size of clear cuts and overall silvicultural practices.[50] Moreover, with the persistent contraction of the private sector in forest industries, the government has had to take on an increasing responsibility for the maintenance of watershed quality and ecological integrity of Japan's forests at large. Of course all of this requires money, and additional funds, as well be explained latter, have not been forthcoming.

In addition to changes in public opinion at large, the Forestry Agency has experienced a persistent decline in the size and cohesion of those constituents who stand to gain from, and therefore support, past timber-oriented policies. Alongside the rapid decrease in the population of forestry workers and inhabitants in rural forestry regions in general, the number of those remaining inhabitants who gain their livelihood from occupations unrelated to forestry has been on the rise. Whether they are commuters to Japan's urban centers or workers in the growing recreation and tourist industry, these inhabitants have come to value and rely upon the environmental and aesthetic amenities of their regions and are often directly opposed to the commercial enterprise of forestry as a whole. What this means is that the Forestry Agency increasingly cannot rely upon the sort cohesive voting behavior which has proved so effective in shaping economic policy in other areas in the past, most notably price supports and trade restrictions for rice and other agricultural goods.

The force of public opinion and the lack of concentrated support for Forest Agency timber production policies are perhaps best illustrated by the fact that in two recent, well publicized controversies regarding agency plans for development on public lands, the agency was thwarted by strong opposition arising from both national and local environmental groups. The controversies involved development in the Shiretoko National Forest in Hokkaido and the Shirakami beech forest in Iwate and Aomori prefectures.[51] In both cases officials, environmental groups and individuals on the local

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[50] *Ibid.*, pp. 111-12.

[51] For a detailed narrative of the Shiretoko National Forest case see: Mitsuda Hisayoshi and Robert G. Lee, 1990, and, Nihon Bengoshi Rengokai, *Shiretoko Kokuyurin no Shizen Hogo ni Kan Suru Ikensho*, 1988. For a description of the Shirakami case see: Suzuki, 1986, p. 23-4, and, Nihon Bengoshi Rengokai, *Shirakami no Shizen Hogo ni Kan Suru Ikensho*, 1988.

level provided the initial impetus for the opposition movement and were latter joined by national groups which were able to garner more publicity and devote greater resources to the campaign. Moreover, though the cooperation of both local and national groups was no doubt essential to the ultimate success of the movements, it should be noted that it was the local organizations who were instrumental in keeping the issue alive through the many years over which the controversies played themselves out. One town adjacent to one of the planed development projects elected a prominent local environmentalist to be its mayor, in spite of its heavy dependence on the timber industry,[52] and in another instance the prefectural forestry workers union came out against plans to clear cut areas within national park boundaries, citing recreational and geothermal development already going on in the vicinity and the small number of forestry workers in the area as their primary cause.[53] In the same area, an opinion poll showed a high degree of concern for conservation on the part of local residents, with 33.2% of local inhabitants claiming that they were extremely concerned about "protecting nature," as compared to 19.6% for the general public.[54] This would indicate that in many instances the Forest Agency cannot rely upon local residents, its most logical ally, for support in its efforts to confront opposition from national environmental organizations, other ministries, and public opinion at large.

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[52]Mistuda, *Opcit.*.

[53]*Asahi Shimbun*, June 19, 1987.

[54]Mistuda Hisayoshi, 1989, p. 103.

d) The National Forests

Though it is hard to discern any significant impact on public works subsidies as a result of the political weaknesses of the Forestry Agency outlined above, the other major Forest Agency budget, the National Forest Special Business Account (NFSBA) provides a graphic illustration of the sort of problems the agency is currently facing. Established in 1947, the NFSBA was set up as a self-supporting account in which funds derived from timber sales from the National Forests were to be used for the further maintenance and development of these public lands. The NFSBA is used to administer approximately 7.8 million hectares of forest land, 2 million hectares of which are softwood plantations. This land accounts for 31% of Japan's total forest area and 34% of total production.[55] The NFSBA itself has consistently accounted for about two-thirds of the Forest Agency's total budget. As a result, this account has a direct effect upon the overall health of the Forest Agency as well as a significant portion of Japan's timber production. The NFSBA, however, is in serious trouble and has been so for years.

Many observers have questioned the advisability of administering the national forests solely from revenues derived from timber sales from the these same forests. In the words of one forester working for the United States during the occupation:

> In principle little logical relation exists between the amount of money required for the administration of national forests and the sale value of their products. A national forest budget should be determined by actual needs which in some cases, as in the development of inaccessible areas, may be far in excess of income for a particular period. . . The national forest budget itself should be based on actual needs.[56]

Beginning in 1975 the sort of problems foreseen above began to make themselves apparent in the form of chronic budget deficits which, though in apparent violation of the NFSBA's charter law, have continued to this day. Throughout the latter half of the 1980s the NFSBA had to borrow close to half of the funds necessary for its total operating budget of approximately 550

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[55]Nihon Ringyo Kyokai, 1991.
[56]Cummings, 1951, p. 28.

billion yen,[57] and in 1990 the account's cumulative debt exceeded 2.2 trillion yen (close to 17 billion dollars U.S.), a 48% increase over the 1986 level.[58]

As a result of this burgeoning debt, the Forest Agency has been subject to increasing criticism from other government agencies[59] and has been forced to institute drastic reductions in its work force. The agency currently employs around 34,000 workers, as compared to 43,400 in 1983 and 89,000 in 1978. These cuts, however, have not been sufficient to significantly reduce the NFSBA deficit, and a further reduction of some 14,000 workers by 1993 is planned in hopes of eliminating the deficit by 1997. Even these cuts, however, have been considered inadequate by the Management and Coordination Agency.[60]

Many of the cutbacks will occur among the ranks of the Forest Agency's full-time forest workers, and, ostensibly, the agency intends to maintain current levels of production through the use of labor contracted from the private sector. Nevertheless, many of the same diseconomies will still apply, and it is extremely doubtful that the agency will be able to balance its budget without greatly scaling back its operations and concentrating only upon its most profitable enterprises. Whatever the case may be, it is certain that the Forest Agency is currently finding itself in a particularly desperate situation and would not be eliminating a large proportion of its work force if not for strong pressure from other agencies.

In recent years the Forest Agency has tried to institute several schemes to bolster its revenues. Most notable among these was a proposed water resource tax in which taxes would be levied upon downstream beneficiaries in order to partially offset the costs incurred by soil conservation programs undertaken in the upper reaches of Japan's rivers. The Forest Agency was unable, however, to get the tax enacted. The circumstances surrounding this

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[57] See chart, Norin Tokei Kyokai, 1989, p. 146.

[58] Nihon Ringyo Kyokai, 1991.

[59] Most notable among these is the Prime Minister's Office, the General Affairs Agency, the Ministry of Finance, and the Management and Coordination Agency.

[60] "Further Cuts Urged for Forestry Program," in *The Yomiuri Daily*, July 3, 1990.

failure clearly illustrated the current lack of political muscle in the Forest Agency and the sort of opposition with which it must contend. Essentially, the agency found itself trapped between industrial interests represented by the Ministry of International Trade and Industry (MITI), who would be the primary targets of the new tax, and the Ministry of Finance (MOF). Whereas MITI, with the backing of Vice Prime Minister Shin Kanemaru, maintained that funds for water resource conservation should be supplied by the General Account, MOF rejected any expenditure to be used for such purposes, and the Forest Agency was left out in the cold.[61]

In addition to the above plan, the Forest Agency has also resorted to the sale of national forest land in order to help reduce the NFSBA deficit. These sales have primarily been to recreational developers interested in building golf courses and ski resorts, both of which currently constitute booming industries in Japan. As such, the sales represent a reduction of area devoted to timber production and are symbolic of an overall trend away from the primary sector to a tertiary economy which views its forests as a recreational playground and ecological reserve. The Forest Agency has increasingly tried to portray itself as the steward of this natural hinterland (as opposed to general manager and promoter of timber production), but it has been unable to garner the political support or funds necessary to fulfill this role. It is, instead, shrinking in size and importance along with the industry it was designed to administer.

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[61] *Japan Lumber Journal*, 28:1 (Jan. 1987), pp. 6-7.

IV. Conclusion

The foregoing analysis has concentrated upon factors endogenous to Japan's forest economy, assuming generally stable conditions within the international market for wood products. Given these conditions, it is unlikely that the predictions for increased production reviewed in section II will be realized. Rather than harvesting the vast resources planted in the middle to latter half of the nineteenth century, efforts in forestry in the first decades of the twentieth century will more likely be devoted to effecting the conversion of many of Japan's forest plantations back to natural, or pseudo-natural, forests which will require far less labor in their maintenance. Undoubtedly, most if not all of Japan's traditionally viable forest regions will continue to produce modest levels of high quality timber for the upper end of the Japanese wood products market, but the "age of domestic timber" will certainly not materialize as it was envisioned by the Forest Agency and other sympathetic observers of the forestry sector.

The related implications of this for foreign producers are obvious. The market for low and medium priced wood products will continue to present opportunities well into the next century for suppliers who successfully tailor their products (and their marketing strategies) to the needs of the Japanese. Countries such as New Zealand and Chile have already positioned themselves to supply the lower end of this market, and Siberia could provide an even greater amount of low cost timber if and when the needed infrastructure is put into place.[62] Much of this wood will be used to supply Japan's growing demand for pulp wood. It follows from the above that the greatest long range market potential for U.S. Pacific Northwest timber lies in the medium priced end-use categories, most notably structural lumber and similar products for which second growth Douglas Fir and Hemlock are well suited.

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[62]See Backman and Waggener, 1991, for an assessment of Siberia's productive potential.

Another market with promise is that of softwood plywood, consumption of which has posted rapid and consistent gains in recent years. With predicted hardwood resource constraints in South East Asia, historically Japan's largest supplier of hardwood plywood and peeler logs, the Japanese have been devoting a great deal of effort to developing softwood plywood technologies and expanding softwood use. Consumption in this market can be expected to rise at a strong pace. At present Canada commands approximately 85% of the market share in the softwood plywood market, but other producers who make a concerted effort to supply this growing market should find their efforts rewarded.

Another promising development for foreign producers is the fact that the Japanese are feeling more and more vulnerable, both politically and economically, to accusations regarding unfair trade practices. They are extremely aware of their country's reliance on the global economy, and the government will increasingly make efforts to minimize such criticism. Rather than impact crucial manufacturing industries, the Japanese can be expected to "sacrifice" less essential industries such as forestry. Much of this, however, is dependent upon the trade pressure foreign countries exert, and upon the relatively weak political influence of the Forest Agency. In any case, after it becomes obvious that increased harvests of domestic timber will not materialize, the Japanese will most likely resign themselves to current or even greater levels of imports and devote an increasing amount of energy to securing stable overseas suppliers for their growing economy.

Nonetheless, the Japanese cannot and will not simply walk away from forestry as they perhaps might from some failed manufacturing enterprise. From the standpoint of soil conservation and flood control alone, the environmental health of Japan's forests are much too important to be ignored. Moreover, the Japanese increasingly realize the ecological and recreational value of their forest resources, considerations which have had little influence in forest policy and economics in the past but promise to become more and more important in the near future.

In light of these changes, Japanese foresters and policy makers have begun to place greater stress on the importance of developing multiple-use

management regimes which emphasize these changing values. Along with these new management systems, new political structures which seek to identify the values and expectations the Japanese hold regarding their forests and which allocate funds accordingly must also be developed. The ability of the Forest Agency and the Japanese forestry community at large to achieve this shift will have a significant impact on the shape of Japan's forests in the next century and beyond.

Adjusting to these changes constitutes a considerable challenge, a challenge to which foresters, bureaucrats and members of the academic community in Japan are giving a great deal of thought. The successes and failures of the Japanese in devising new policies and management regimes to meet this challenge will be of great value to those elsewhere who are attempting to discern the place of forests and forestry in the modern economies of today's world. In this sense, the crisis currently confronting forestry in Japan carries with it an opportunity for innovation as old approaches which stress domestic self-sufficiency are no longer viable. New approaches which adequately reflect the global realities of Japan's forest economy as well as the needs and wants of its people are urgently needed. Simply stated, Japanese timber enjoys little or no comparative advantage in the global market, and, as a result, Japanese forestry practices and expectations for future harvests will have to adjust.

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