CINTRAFOR NEWS
Center for International Trade in Forest Products
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Peace Corps Master's International Program *Celebrates its Tenth Anniversary*

The Peace Corps Master's International Forestry Program in the School of Environmental and Forest Sciences (SEFS) celebrated its 10th anniversary in February. The UW campus boasts three PCMI Program including Forestry, Global Health and Public Affairs. The growth of the PCMI program at the UW has been rapid and for the last four years the UW Graduate program has been rated in the Top 2 by Peace Corps in terms of graduate student enrollment (see below). To celebrate the 10th anniversary of the PCMI Forestry program, Peace Corps Acting Director Carrie Hessler-Radelet met with SEFS faculty, students and staff to present a Certificate of Recognition. While at SEFS Director Hessler-Radelet met with current and returned Peace Corps students from across campus to share experiences and answer questions (see photo below).

The Peace Corps Master's International Program in forestry and natural resource management is a unique partnership between the University of Washington, SEFS and the Peace Corps which provides students the opportunity to incorporate Peace Corps service into an intensive graduate program in forestry and natural resource management. Following their first year of academic study, students depart for their assigned country. While in country, they take part in three months of intensive Peace Corps technical, cross-cultural and language training, followed by two years of Peace Corps service working to improve the environment with people who use and depend upon a healthy ecosystem for their livelihoods and that of their children. Following the conclusion of their Peace Corps service, the students return to UW for a final quarter where they write up their PCMI project report.

The PCMI Forestry program has graduated five students from the program since it started in the Autumn of 2003. Currently it has four students serving in Peace Corps (Seth Kammer, Ethiopia; Cynthia Harbison Cameroon; Johnny Bruce Paraguay and Patrick Wauters Senegal). In addition, the program has six students who are taking classes in the first year of the program. The current PCMI students have begun to receive their Peace Corps country assignments, with Kevin and Beth Dillon being assigned to the Philippines and both Corey Dolbeare and Gwen Stacy having received assignments in Senegal.

Photo by Erik Wirsing.

PCMI faculty and students meet with Peace Corps Acting Director Carrie Hessler-Radelet (from left: Natlie Footen (RPCV Senegal '08-'10), Beth and Kevin Dillon, Gwen Stacey, Mikhael Kazzi, Corey 'Bear' Dolbeare, Alia Kroos, Maggie Wilder, Director Carrie-Hessler-Radelet (RPCV Western Samoa '81-'83) and Dr. Ivan Eastin (SEFS PCMI Faculty Leader and RPCV Liberia '85-'87).

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Director's Notes

A Focus on Japanese Forestry & Wood Manufacturing Sectors

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The Center for International Trade in Forest Products addresses opportunities and problems related to the international trade of wood and fiber products. Emphasizing forest economics and policy impacts, international marketing, technology developments, and value-added forest products, CINTRAFOR's work results in a variety of publications, professional gatherings, and consultations with public policy makers, industry representatives, and community members.

Located in the Pacific Northwest, CINTRAFOR is administered through the School of Environmental & Forest Sciences at the University of Washington under the guidance of an Executive Board representing both large and small companies, agencies, and academics. It is supported by state, federal, and private grants. The Center's interdisciplinary research is carried out by university faculty and graduate students, internal staff, and through cooperative arrangements with professional groups and individuals.

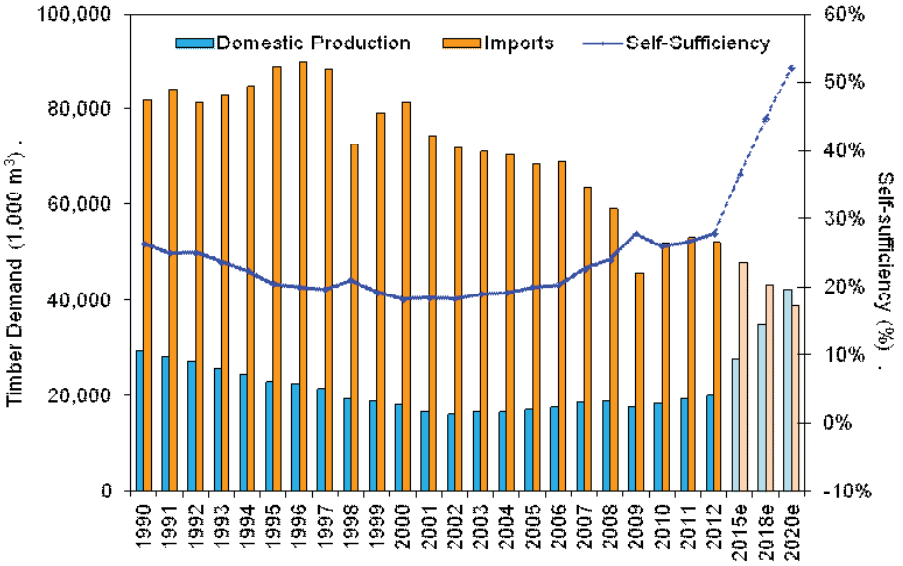
Japan is a timber deficit country that imports substantial volumes of timber to meet its domestic demand for wood. To a large degree, wood demand in Japan is tied to housing starts and approximately 55% of the new homes in Japan were built using wood in 2012. This reliance on imported wood has always caused a certain tension in Japan where forests cover two-thirds of the country and there is an extensive sawmill industry skewed heavily to small, rural sawmills using inefficient and out-dated technology. Relatively high production costs have made both domestic logs and lumber uncompetitive on a global scale and, as a result, lower cost imported wood products have become an important source of supply within Japan.

Over the years, the Japanese government and the forest products industry have tried a number of strategies to improve the competitiveness of the forestry and sawmill sectors. Despite the closure of more than 13,000 sawmills over the past twenty five years (the number of sawmills has dropped from 20,256 in 1983 to 6,242 in 2011), the Japanese sawmill industry remains uncompetitive and plagued by small, inefficient sawmills located in rural areas far from the main demand markets. It is against this backdrop that the regulatory initiatives designed to subsidize the revitalization of the domestic forestry and sawmill industries must be viewed. The most recent regulatory initiatives will develop an extensive system of subsidies and regulations designed to increase the volume of timber harvested from domestic forests while promoting the expanded use of domestic wood in the construction of both public buildings and residential homes.

This complex combination of regulations and subsidies could have a serious impact on the forest products industry in the US, particularly in the Pacific Northwest. With the US economy still feeling the effects of the housing crisis, and housing starts remaining at historically low levels, export markets have been the one bright spot in an otherwise dismal economic landscape for the forest products industry. With housing starts reaching just 789,000 in 2012 and domestic demand for wood products at historically low levels, total US forest products exports have increased by 46% since 2009, rising from $5.2 billion in 2009 to $7.5 billion in 2012. Japan is the third largest destination for US wood exports, with exports of wood products increasing from $517 million in 2010 to approximately $730 million in 2012. Clearly any program designed to raise the market share of domestic wood in Japan will adversely impact the competitiveness of imported wood and would have serious implications for forest products manufacturers in the Pacific Northwest, many of whom are located in rural, timber-dependent communities who have been particularly hard hit by the economic crisis.

Over the past several years, Japanese governments at the national, prefectural and municipal levels have adopted a wide range of measures aimed at increasing the use of domestic wood. These policies and programs, if successful, would have a serious adverse impact on the competitiveness of US wood products in Japan and undermine the ability of US manufacturers and exporters to compete in Japan. The following paragraphs provide a summary of the most important policies and programs that have been implemented in Japan.

The first program, introduced by Prime Minister Yasua Fukuda, was designed to improve the quality and longevity of residential housing in Japan. This program is referred to as the 200 Year House or the Long-Term Superior Housing Program. A second program, the Housing Eco-Points Program, was primarily developed as an economic stimulus measure in 2009 that was designed to encourage builders and consumers to purchase energy efficient building materials, although a secondary focus of the program was to improve the environmental performance and energy efficiency of Japanese homes and condominiums. This program has been continued every year since its introduction and a new version of the program has been formulated that would provide subsidies for using domestic wood in both new home construction and renovation projects. The third program is the Promotion for the Use of Wood in Public



Japan production, imports and self-sufficiency in forest products.

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Buildings Law. This Law is an important change in the building and renovation policies of Japan's central government and municipalities. Implemented in October 2010, the Law seeks to increase the use of Japanese domestic wood by requiring all central and local government building projects (up to 3-story buildings with less than 3,000 square meters in floor area) to either be constructed with wood, or at least utilize wood materials for the building interiors. The Law has been accompanied by an increase in wood used for private non-residential construction such as nursing homes, kindergartens, and commercial facilities.

The fourth program is referred to as the Forest and Forestry Revitalization Program. Initially introduced in 2009, the Revitalization Plan was approved by the Diet in 2011. The Revitalization Plan was designed to increase the market share of domestic wood from its current 26% to 50% by 2020. The expansion of the domestic wood supply would be achieved through a combination of sectoral reforms and massive subsidies designed to expand the timber supply while simultaneously increasing the use of domestic wood in both residential and public sector construction (Figure 1). The fifth program is called the Feed-in Tariff System and it was implemented in July 2012. In an effort to increase the competitiveness of low value, low quality forest residuals derived from forest health operations, the Japanese government has established a "Fixed Price Purchasing System for Renewable Energy" that essentially subsidizes the removal of forest residuals for the production of renewable energy. The price of ¥8,000 per m^3 of woody biomass (33.6 yen per kilowatt-hour) was established to ensure the profitability of operations to remove forest thinnings and residuals. The program aims to use up to 20 million cubic meters of forest thinnings per year by 2020.

Given the new Forest and Forestry Revitalization Plan that is being implemented in Japan, along with the myriad of existing subsidy programs designed to expand the use of domestic wood in construction, it is critical that the US undertake research designed to understand the potential implications of these programs on the competitiveness of US wood products in Japan. To help industry managers and policymakers in the US understand the context within which these programs are being implemented, we will be publishing summary articles focusing on specific sectors of the forestry industry in Japan. This edition of the CINTRAFOR News will highlight the forest resource in Japan while future editions will provide an overview of the wood manufacturing sector as well as the housing industry. The final article of the series will describe the potential economic impact of the domestic wood subsidies on US exports of wood products to Japan.

Japan's Forest Resource

By: Ivan Eastin, School of Environmental and Forest Sciences, University of Washington

Contrary to most people's impression, Japan is a richly forested country with forests covering more than two-thirds of its land area (Table 1). However, this has not always been true. During the Second World War the forests of Japan were devastated to provide fuelwood for both the industrial sector involved in the war effort as well as to provide heating and cooking fuel for families. Following the conclusion of the war, a massive replanting effort was undertaken to restore the forests of Japan. This effort was hugely successful although the passage of time has shown that some strategic mistakes were made. For example, the vast majority of the trees planted were Japanese cedar (sugi) of poor genetic quality and as a result, the quality of the sugi resource is poor. In addition, the strain of sugi chosen gives off large amounts of pollen, which has contributed to the growing number of asthma cases that occur every spring.

The ratio of forest cover is generally consistent across Japan, with the exception of the Kanto region (with the heavily industrial prefectures of Tokyo, Chiba, and Kanagawa) in eastern Japan. Forest cover ranges from 74.5% of the land area in rural Chubu and Shikoku regions to just 44.5% in the heavily industrialized Kanto region. The majority of the forest resource in Japan lies in the northern and western regions of the country, with 22.4% of the forest area located on the island of Hokkaido, 18.6% in the Tohoku region, and 18.3% in the Chubu region.

Forest Ownership

A breakdown of forest owner's by size of forest holding shows that approximately 58% of private forests are less than one hectare and an additional 31% are less than five hectares (Table 2). More importantly, barely one percent of forest owners in Japan have forest holdings that exceed 30 hectares. From 1970-1990, the forestry statistics show that there has been a trend towards smaller forest holdings as forests that are 1 to 10 hectares have generally been converted to smaller forests of less

Table 1. Forest area and forest households in 2010, by region.

Region	Total Land Area (hectares)	Percent Forested	Total Forest Area (hectares)				Forest Households (number)	Average Forest Size (ha)
			Total Forest	Total (%)	Private Forest	Private (%)		
Total	36,684,500	68.2%	25,026,282	100%	14,004,553	100%	2,508,605	9.98

Source: 84th Statistical Yearbook of MAFF, 2011.

Table 2. Number of forestry households by area of forest owned.

	Total	<1	3 ～ 5	5 ～ 10	10 ～ 20	20 ～ 30	30 ～ 50	50 ～ 100	100 ～ 500	500～1,000	> 1,000ha
Nationwide	906,805	520,123	160,563	119,292	64,163	19,504	13,005	6,797	3,089	193	76

Source: http://www.e-stat.go.jp/SG1/estat/ListE.do?bid=000001037762&cycode=0

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Table 3. Growing stock in Japanese forests in 2007 **Area: 1,000 hectare)**
(Growing stock: thousand cubic meters

	Total				Planted forest				Natural forest			
	Growing stock				Growing stock				Growing Stock			
	Area	Total	SW	HW	Area	Subtotal	SW	HW	Area	Subtotal	SW	HW
Total	25,097	4,431,737	3,078,921	1,352,816	10,347	2,651,307	2,607,527	43,780	13,383	1,779,393	471,245	1,308,148
National forest	7,686	1,078,272	606,887	471,385	2,364	423,611	396,160	27,451	4,691	653,805	210,609	443,196
Public Forest	2,830	484,326	337,057	147,269	1,247	294,618	291,197	3,421	1,449	189,627	45,849	143,778
Private forest	14,535	2,863,512	2,131,341	732,171	6,724	1,930,599	1,917,705	12,894	7,217	932,813	213,616	719,197

Source: 84th Statistical Yearbook of MAFF, 2011.

than one hectare. This ownership pattern has clear implication for the ability of private forest owners to economically manage their forests for timber production. It also restricts the ability of forest owners to access the capital required to actively manage their forests and improve the quality of their resource.

Almost 60% of the forests in Japan are privately owned, 31% are owned by the national government, and other public groups own 11% (Table 3). Other public groups that own forest areas include prefectural governments (38.3%) and municipal governments (39.2%). Private forests are distributed across a large number of small plots with over 2.5 million owners. The average size of forest holding is just under 10 hectares per forest owner, although this statistic seriously overstates the size of the typical forest holding.

By area, the largest forest areas are located in the Hokkaido, Tohoku, and Chubu regions. The largest private forest areas are located in the Chubu, Tohoku, Kyusu-Okinawa, Kinki, and Chugoku regions. As a percentage of forest ownership, public forest ownership is highest on the island of Hokkaido (71.1%) and lowest in the Shikoku (23.4%), Chugoku (22.6%) and Kinki (17.4%) regions.

Forest type and stocking volumes

Over half of the forests in Japan (53.2%) are classified as natural forests while the remainder are artificial (plantation) forests (Table 3). The majority of the National Forests are natural forests (61%) while private and other public forests are more evenly distributed between natural and plantation forests. The volume of growing stock in Japan's forests totaled 4.4 billion cubic meters in 2007 and it has more than doubled since 1966 (Figure 1). At the same time, forest management activities (e.g., thinning) and harvest levels have remained low, leading to the very high stocking volumes. As might be expected, the majority of the growing stock (64.6%) is located in private forests, although private forests represent 58% of the forest area. In contrast, national forests contain only 24.3% of the growing stock, while they represent 30.6% of the total forest area.

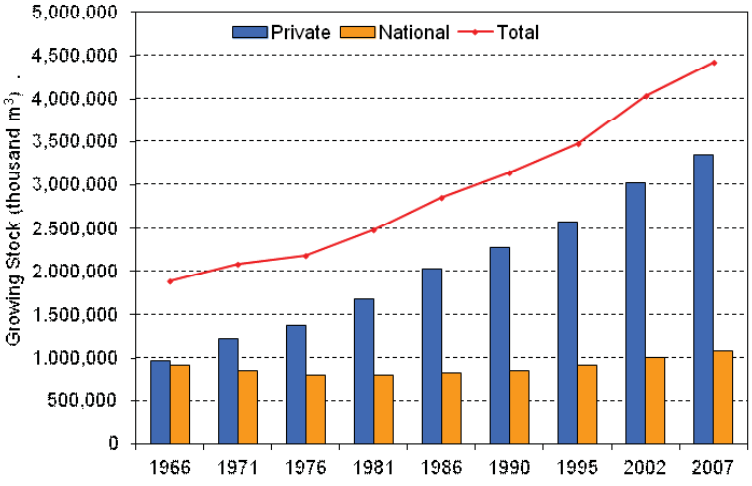

Figure 1. Inventory of growing stock in Japanese forests.

Japan's growing stock is approximately two-thirds softwood species and one-third hardwood species. While the National Forests display a more balanced level of stocking between hardwood and softwood species, private forests are heavily skewed towards softwood species. This is due to a combination of factors, including the fact that 76.5% of the area of plantation forest ownership is private or "other public", the stocking volume in natural forests (119 m^3 per hectare) is substantially lower than in plantation forests (181 m^3 per hectare), and the species distribution in plantation forests is almost entirely softwoods (99.4%).

Approximately 8.8 million hectares of primarily publicly owned forests have been designated as protection forests. The dominant type of protection forests are headwater conservation forests (72%) followed by soil loss prevention forests (23.7%). The total area of protection forests represent approximately 35.2% of all forest area in Japan.

Forest age and species distribution

The age class distribution for private and National Forests is presented in Figure 2, although age class information is not available for other publicly owned forests. The data clearly shows a bimodal distribution for both the private and national forest resource, with peaks at 41 to 50 year age class and at 81+ year age class. Over half of the total forest area is less than 50 years of age (53.5%; mostly located in private forests) while an additional 16.4% is over 80 years of age (mostly located in the national forests). Clearly, the age class distribution for private forests is substantially different than that of the National Forests. Almost two-thirds of the private forest resource is between 31 and 60 years of age while over half of the National Forest resource is in excess of 81 years in age.

Since the majority of the National Forest area has been set aside for protection, we would expect to see a distribution skewed towards the older age classes. The bulk of the private forest resource, which is more actively managed for timber produc-

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tion, is clustered in the 31 to 60 year age classes. Given a forty to sixty year rotation for the major softwood species in Japan, it is obvious that there is already a large volume of timber becoming available for harvest in the private forests. The fact that harvest volumes are lower than we would expect reflects the fact that harvesting costs are high in Japan, wood quality is average at best, labor is expensive and hard to find, and the logging road infrastructure is severely undeveloped.

Another way of analyzing the age class distribution of forests in Japan is plantation versus natural forest. This type of classification shows that almost 60% of plantation forests are between 31 years and 50 years of age. It also shows that the age class distribution in natural forests is bimodal, with about 35% of natural forests between 41 and 60 years of age and another almost 40% over 81 years of age.

The data presented in Table 3 shows that softwood species are the predominant species in plantation forests. The two primary commercial softwood species grown in Japan are sugi (Japanese cedar) and hinoki (Japanese cypress). Sugi is the dominant species in Japan, planted on over 4.5 million hectares compared to approximately 2.5 million hectares of hinoki and 3.31 million hectares of other species (notably pine and larch). However, it is interesting to note that while sugi is the dominant species in the 35 to 70 year age classes, the area planted in sugi and hinoki over the past twenty years has been roughly equivalent (although at much lower volumes). This would suggest that there has been a fundamental shift in the timber market and forest management philosophies over the past twenty years that has changed the relationship between these species. Certainly the higher market value and quality of hinoki is one factor as is the serious problem of pollen release associated with sugi, particularly in areas adjacent to major metropolitan cities.

Reforestation

Since the end of the Second World War the Japanese have replanted over 12 million hectares of forest (Figure 3). The majority of the reforested area is located on private and other public lands, although a substantial amount of reforestation occurred within the National Forests between 1955 and 1985. From 1950-1970, the total area of land reforested annually was quite high, fluctuating between 300,000 and 430,000 hectares. However, since 1970 the area of land reforested has been steadily declining, dropping to less than 30,000 hectares since 2000.

The reforestation data show that hinoki and sugi have been the predominant species planted in Japan, although between 1950 and 1970, pine and larch represented a substantial percentage of the area reforested in Japan (Figure 3). In fact, throughout this period the area planted in hinoki, pine and larch was approximately equivalent. However, by the early 1980s, the majority of the area reforested in Japan was in either sugi or hinoki, and, as a result, the Japanese forest inventory is heavy to sugi and hinoki. It is only in the past few years that the ratio of sugi and hinoki has dropped in favor of other species such as pine and larch, although the total area being reforested in these years is quite low and thus will have little impact on the overall species mix in Japanese forests.

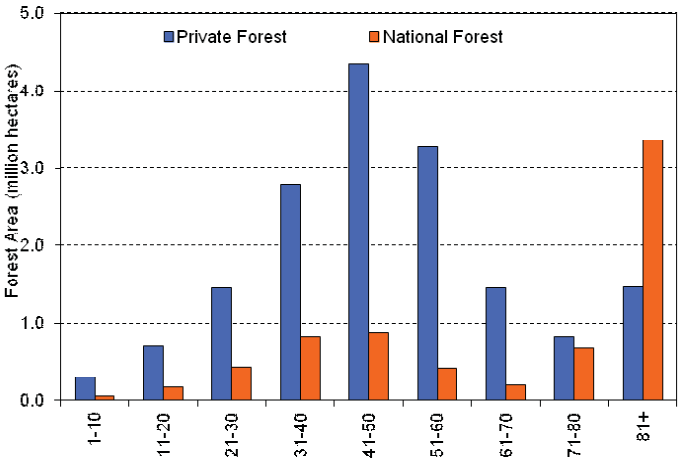

Figure 2. Age class distribution of forests in Japan, by ownership.

Timber Harvest

Harvest, by ownership

Timber harvests in Japan have generally been declining over the period 1950-2003 (Figure 4). The majority of timber harvest has been from private forests, although the National Forests play an important role in the timber supply (particularly since 2005 when the Revitalization Plan was introduced). In contrast, prefectural and municipal forests (other public forests represent about 11% of the growing stock) have traditionally supplied approximately 5% or less of the timber harvest. The trend in timber harvest volume can

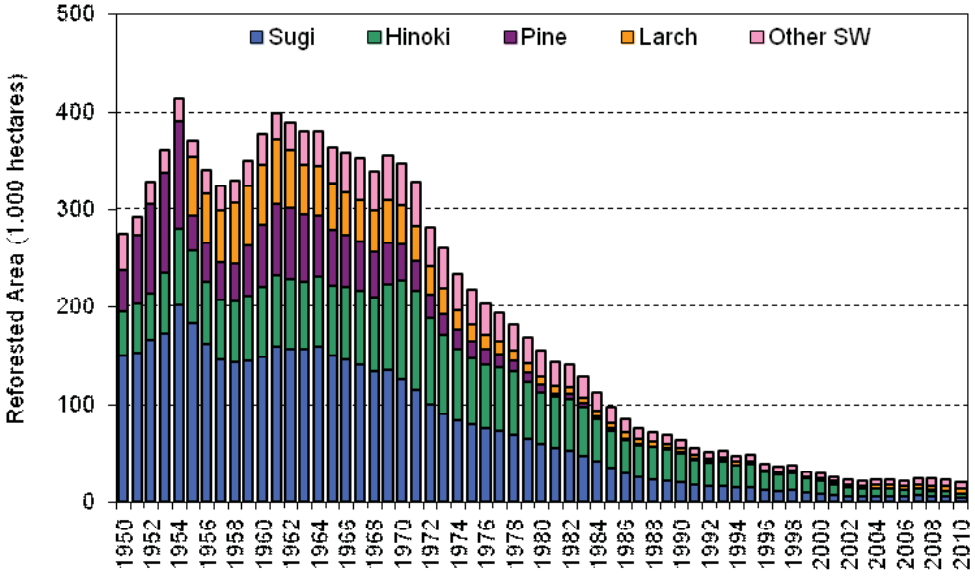

Figure 3. Annual area reforested in Japan, by species, 1950-2010.

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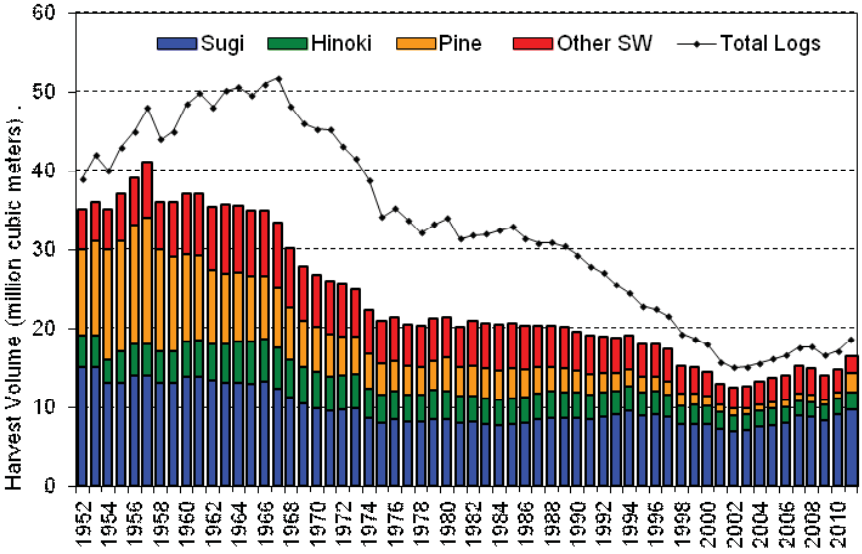

Figure 4. Total log harvest volume in Japan, by species.

be broken down into two periods: 1965-2003 and 2003-today. In the first period, the timber harvest from both private and National Forests harvests declined sharply, although private timber harvest volumes increased slightly in the 1980s. In contrast, the post-2003 period has seen a substantial increase in timber harvest volumes, particularly from the National Forests. This reversal in timber harvest volumes can, to a large extent, be traced to the adoption of the Forest and Forestry Revitalization Plan in 2005. While private forest owners have been slow to increase their harvests in response to the Plan, timber harvest volumes within public forests have risen dramatically, jumping by 41.3% since 2005.

Harvest, by species

At the species level, there have been two important changes in the mix of logs harvested. First, as described above, the volume of hardwood logs harvested has declined significantly since the mid-1970s (Figure 4). While there is little species specific data collected for the hardwood harvest in Japan, anecdotal data collected through personal interviews in Japan suggest that the main hardwood species harvested is oak followed by beech and ash (one reason for this lack of harvest data is that the bulk of the hardwood harvest is used to produce chips for the pulp and paper industry, hence the species is less important than the volume). Second, the volume of pine harvested in Japan declined significantly between 1952 and 1998. During this period, the volume of pine logs harvested declined from 11 million cubic meters (28.2% of the total log harvest) to 2 million cubic meters (10.5% of the total log harvest).

From 1952-1974, the percentage of hardwoods in Japan's timber harvests increased from 12.8% to 43.6% of the total logs harvested. In contrast, the softwood log harvest during this period declined substantially. Between 1975 and 1990, the volume of softwood logs harvested stabilized at approximately 20 million cubic meters, while the volume of hardwood logs harvested was approximately 10 million cubic meters. Following the end of the Bubble Economy in 1989, timber harvest volumes dropped from 30 million cubic meters to 15 million cubic meters by 2003, with substantial declines in the harvest of both softwood logs and hardwood logs. It is only since the introduction of the Revitalization plan in 2005 that there has been a resurgence in the timber harvest, with the timber harvest projected to reach 20 million cubic meters in 2012. However, virtually all of the increase can be attributed to increased harvests of sugi, and to a lesser extent, pine. The volume of hardwood logs harvested actually declined between 2005 and 2011.

Stumpage price trends

The stumpage price data displays not only the price trends for the three major softwood species, it also highlights the fact that each of these species is differentiated in the marketplace (Figure 5). This differentiation is clearly illustrated by the fact that hinoki consistently receives a price premium relative to sugi and pine, particularly after 1965. In contrast, the price premium for sugi relative to pine is substantially less than that for hinoki. The data shows that since 1965 hinoki has been perceived to be the most valuable softwood species as indicated by the huge price premium that buyers are willing to pay for hinoki logs. While the price premium for sugi logs over pine is substantially smaller, end-users clearly attach a higher value to sugi relative to pine. Partly this is due to the cultural role of sugi within the post and beam construction system where it has been traditionally used in vertical posts and in exposed applications within the traditional tatami room.

Between 1966 and 1980, stumpage prices

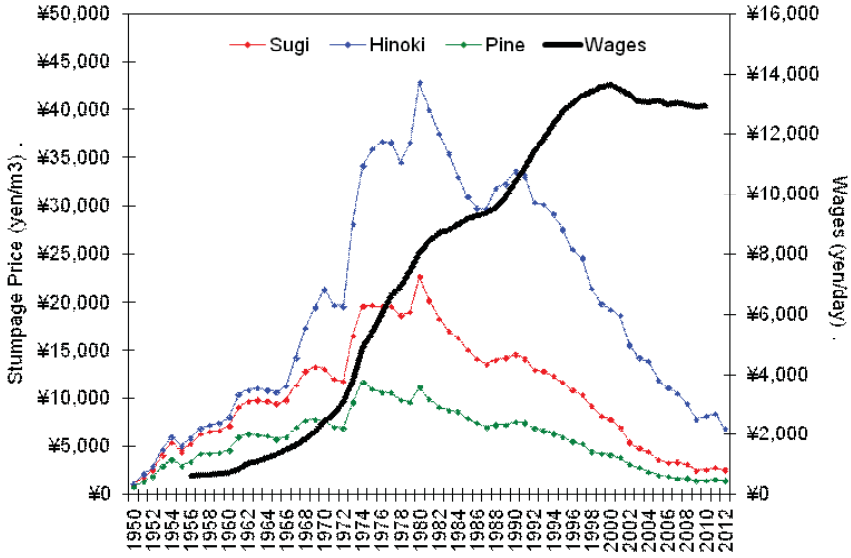

Figure 5. Forestry labor wages relative to stumpage price trends for the major SW species.

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for these species rose at an annual rate of 8.8% for sugi, 18.7% for hinoki and 5.9% for pine. It was during this period that the price differential between hinoki and the other major species widened significantly. From 1950-1966, the price premium for hinoki relative to sugi had averaged 12.6%, yet during the period 1966 to 1980, the price premium for hinoki (relative to sugi) rose to as high as 92% and averaged a hefty 68.8%.

Beginning in 1981, stumpage prices dropped significantly for all three of the major softwood species. The stumpage price declines ranged from an average annual price decline of 2.6% for hinoki to 2.9% for pine, and 3.1% for sugi. Despite these declines, the price differential for hinoki relative to the other major softwood species continued to rise, reaching 230% in 2006. From 1981-2012, the price premium for hinoki averaged 158.4%, relative to sugi. This is likely a major reason why more area has been reforested with hinoki than sugi since the early 1980s.

MAFF has calculated the internal rate of return for sugi and hinoki plantations during the period 1965 thru 2000, Figure 6. The IRR data shows several troubling trends. First, hinoki plantations have traditionally and consistently provide a substantially higher return than sugi plantations. Second, returns from both sugi and hinoki forest plantations have been declining throughout the entire period. Third, in the absence of subsidies, the IRR for sugi plantations is negative while for hinoki plantations it is close to zero. Finally, even with subsidies the IRR on plantations has been declining and is quite low, just 1.0% for sugi and 2.5% for hinoki in 2000.

It is against this setting of rapidly rising stumpage prices throughout the 1970's, coupled with a booming economy and a strengthening yen, that we see the increased importation of wood products into Japan. In the face of rapidly escalating domestic wood prices, Japanese wood manufacturers and home builders quickly determined that the strong yen made purchasing imported wood products a better value proposition than continuing to purchase domestic wood products. At the same time, by negotiating quarterly price contracts for imported wood products, Japanese importers and manufacturers were able to reduce the price volatility that had become problematic with domestic wood. As a result, the demand for domestic wood declined as its competitiveness fell and imported wood began to be increasingly substituted for domestic wood in the housing market.

Labor wages and demographics

In contrast to stumpage prices, logging wages have increased steadily since 1960 while the number of forestry workers have plunged from over 500,000 workers in 1955 to just 50,000 in 2007 (Figures 5 and 7). At the same time, there has been a significant demographic shift in the forestry industry as the age structure of the workforce has changed dramatically (Figures 7 and

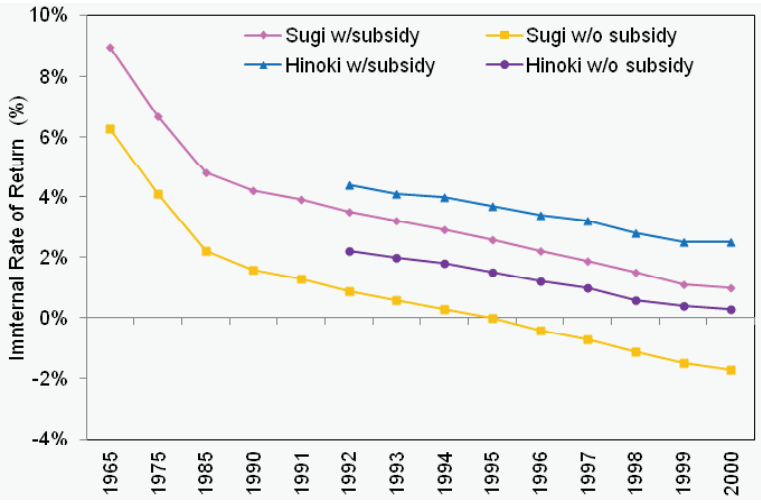

Figure 6. Internal rate of return for forestry plantations in Japan.

8). The most recent survey of forestry workers shows that 57% were over the age of 50 while less than 10% were under the age of 30. The combination of a declining and aging workforce and a rising wage structure has serious implications for the productivity and efficiency of the forestry industry. Recognizing this problem, one component of the Revitalization Plan developed by MAFF has focused on expanding the forestry workforce by emphasizing the outdoor and environmental aspects of the job. This strategy has been successful to a limited extent, and recent employment data shows that the forestry workforce has grown from 50,000 in 2007 to 69,000 in 2010. However, growing the workforce will be a difficult proposition in the future as few young workers value the experience of working in rural areas where there are few young people and the work is characterized by the Japanese phrase: "kitanai, kiken, kitsui" (difficult, dangerous, demanding).

Summary of Forest Industry Trends

Japan's forest sector faces several physical and structural challenges, most of which adversely impact the competitiveness of the forestry sector in general, and the small private forest owner in particular. One of the most basic obstacles

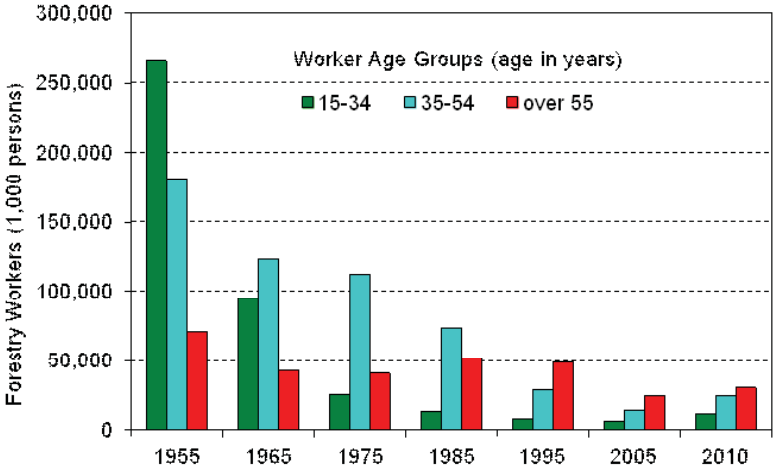

Figure 7. Demographic trends for forestry workers in Japan.

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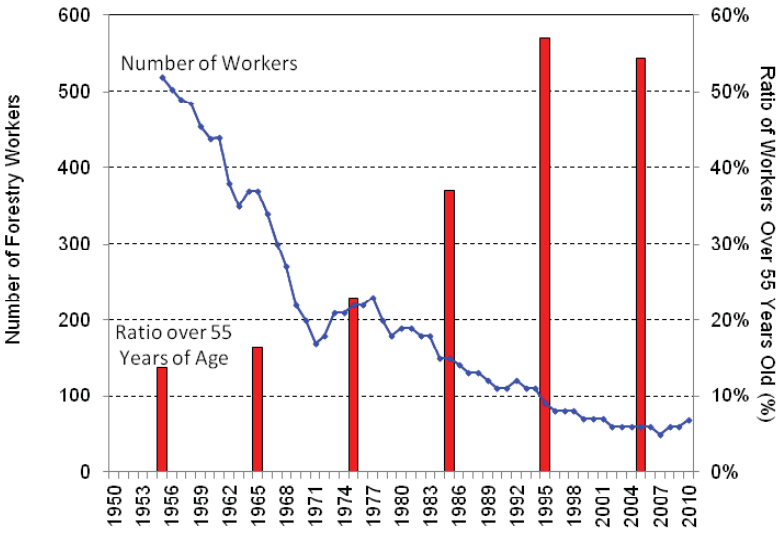

Figure 8. Number of forestry workers and ratio of workers over 55 years of age.

is Japan's geography. Many forests are located in steep terrain, which makes forest management challenging and increases the costs of building roads, harvesting, and transporting logs from the forest. These high costs are further exacerbated by the fact that the majority of private forests are very small, which makes it difficult for the owners to raise capital and harvest their forests. The small size of private forest holdings also makes it difficult to coordinate management and harvest activities to ensure a reliable supply of raw materials to local wood processing facilities, making it difficult for companies to invest in expanding the wood manufacturing capacity in local areas. At the same time, emigration from rural to urban areas reduces the number of available workers. The workers who remain are aging and few younger workers are drawn to the hard and dangerous labor involved with forestry, despite the fact that wages for forestry work are increasing.

Meanwhile, on the demand side, stumpage prices for the major domestic species (sugi, hinoki, and pine) have been declining precipitously since 1980. Caught between rising costs of production and declining prices, many forestry households are finding it more and more difficult to continue in business. This point is aptly illustrated by a set of financial statistics published by the Forestry Agency in Japan. Based on a time series of production cost and stumpage price data, the Forestry Agency has calculated the internal rate of return derived from an investment in a sugi plantation. Using their own methodology, the Forestry Agency estimates that the internal rate of return from a sugi plantation has declined from 6.3% in 1965 to 4.1% in 1975 to 2.1% in 1985 to 0.9% in 1993 (the most current year for which this data is available). Their results clearly show that it is becoming virtually impossible to manage a forest plantation as a viable economic enterprise.

This situation is summarized very succinctly in a passage from a recent book on the historical growth and recent performance of Asian economies. Discussing the business ethic and factors influencing competitiveness in rural Japan, author Nicholas Kristoff, in his recent book entitled "Thunder from the East", emphasizes the relationship between business practices and culture that impacts the ability of small forest owners to maintain their profitability.

> *The paramount concern was not prices or cost but giri-ninjo, an ancient Japanese ethic that translates roughly as "duty and empathy". The result throughout Japan…was an economy whose outward façade was skyscrapers and business suits but whose human interactions were still rooted in traditional concepts of honor. And the collision of the international market economy with rural Japan's giri-ninjo economy was not a pretty sight. Americans may think of Japanese businessmen as ruthless, calculating tigers, but this is true only in sectors that compete abroad. Domestic companies are the opposite. (pp:84)*

In specifically relating this philosophy to the situation of small forest owners, Kristoff points out that most small forest owner's employ an economic principle that does not necessarily aim to maximize profits, but rather takes into account community welfare considerations. This point is highlighted during a discussion he had with a local forest owner in Mie prefecture.

> *The problem is the same as that faced by many sectors of the Japanese economy: A long-sheltered business was exposed to international competition and battered by it. Businesses that had thrived under protectionism faced [international] companies that had been forged in the furnace of free markets…Throughout the 1990s logs and finished wood began to pour into Japan at prices [rural forest owners] could never compete with, and 80 percent of Japan's lumber is now imported. "My break-even cost of selling a log in Tokyo is higher than the price of an American log in Tokyo," Zenzaburo complained. (pp:83)*

The high cost of forestry in Japan relative to other supply regions of the world places Japanese small forest owners at a competitive disadvantage in the marketplace. This suggests that it may be time to reassess the future role of the forestry sector in Japan. Given the comparative disadvantage that Japan faces in the production of timber, it may be better to focus on the environmental role of the forests, rather than the role of the forest as a raw material supply. While this is certainly one small component of the Revitalization Plan, the bigger emphasis is providing subsidies to support the increased use of domestic timber and thereby offset its competitive disadvantage relative to imported timber. One could easily argue that these subsidies will not provide the forestry and wood manufacturers with any long-term competitive advantage. Given the high level of public debt in Japan it would seem to be only a matter of time before the government is forced to reduce or eliminate many of these subsidies. And when that happens, the forestry and wood procucts sector will once again find itself at a competitive disadvantage relative to its foreign competitors. Q4

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