Chapter 4

Japanese Forestation Policies During the 20 Years Following World War II

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Additional information is available at the end of the chapter

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Abstract

During World War II, the area cut annually in Japan exceeded the area planted, and cutover land was common. Within approximately 10 years of the end of the war, however, forestation on cutover land was almost complete. In the 10 years that followed, forestation policies targeted increasing coniferous tree plantations to secure industrial roundwood. Forestation plans and legal systems were developed, and organizations such as the Prefectural Forestry Corporations and Forest Development Corporation were founded to promote the planting of coniferous trees. As a result, approximately 10 million ha of coniferous plantations now exist, roughly 40% of the total forested area, and the area has a growing stock of 3.0 billion m^3. However, some problems resulted from forestation policies. As coniferous trees were planted intensively over a short period of time, the forest age structures became unequal. Many forests have now reached an age class that requires thinning, but the percentage of forests that have been thinned remains insufficient. In addition, all Prefectural Forestry Corporations are now facing serious financial difficulties. Statistics on plantation forests must be improved to create effective management plans, including new reforestation policies.

Keywords: Cutover land, coniferous forest expansion policy, profit-sharing forest, Prefectural Forestry Corporations, plantation forest statistics

1. Introduction

Approximately two-thirds of Japanese land is covered by forests. Since traditional houses were built with wood, and fuelwood was utilized throughout the country, tree planting activities began early. Forest resource control policies were enacted in Japan during the Edo Era (1603–1868) when the feudal domain system (*han*) was developed. Some of the *hans* attached high

value to protecting the increase in forest resources, including forestation policies[1]. Shioya classified the planting activities during the Edo Period into six categories: coercive planting by the seigniory, planting as a criminal punishment, voluntary planting for *han*, planting partially covered by the *han* fund, profit-sharing planting, and privately conducted planting [1]. Various types of planting activities were developed during the Edo Period.

After the Meiji Restoration in 1868, the *han* feudal domain system ended, and the forest resource regulations, which were enacted under the feudal system, were deregulated in 1871. In addition, the demand for forest products increased at the beginning of the Meiji Era (1868-1912). Thus, several problems regarding forest resources emerged. In 1897, the first *Forest Act* (Act No. 46 of 1897) was enacted, the main contents of which were a forest protection system and supervision of forest management. The main forest policy focused on forest management of land owned by the government during the Meiji Era; the *National Forest Act* (Act No. 85 of 1899), the *Act on Special Account for Forest Fund of National Forest* (Act No. 85 of 1899), and the *Ordinance on Management Plan of National Forest* (Instruction No. 42, Ministry of Agriculture and Commerce) were enacted in 1899. Using the special account, preparing a forest plan, measuring forested land, forestation, and new plantations on wild lands had been promoted in the national forest until 1921.

Although the forestation policy for non-national forests was not very comprehensive before World War II, it was composed of the following acts and ordinances [1]. In 1907, the *Ordinance on Promotion of Planting* was defined, and planting trees for military and export use was promoted by subsidy. The *Ordinance on Promotion of Planting in Public Forest* (1910) and the *Act on Planting in Public Forest by Government* (Act No. 7 of 1920) were defined and forestation policies for public forests commenced. The *Ordinance on Subsidy for Planting for Watershed Protection Forest* was created in 1927, and the *Ordinance on Promotion of Planting* for general non-national forests was prepared in 1929, which was the beginning of the current system of subsidies for planting in non-national forests. Some forestation policies were introduced during World War II, but the results were generally poor because of overcutting during wartime and the lack of a budget for subsidies for forestation.

The total volume of domestic forest resources decreased in Japan around World War II, which was exacerbated by several severe meteorological events that occurred in Japan at that time. Many of the cutover areas were planted in approximately 10 years after the end of the war. In the 10 years that followed, the main target of forestation policies changed from planting on cutover lands to increasing the area of plantations with coniferous trees such as Japanese cedar (*Cryptomeria japonica*) and Japanese cypress (*Chamaecyparis obtusa*). Legal systems were developed and organizations for planting were founded in order to promote the planting of coniferous trees. This article address the forestation policies and their background in the 20 years following World War II, during which the major issues were the cutover land problem, promoting the planting of coniferous trees, and the promotion of profit-sharing plantations. The current forestation policies on the problems resulting from the postwar intensive planting are referred to in the Discussion.

1 For English literature on Japanese forestation in Edo Period, see [36].

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Forestation policies[2] are among the most important forestry policies. Reforestation after cutting as well as new planting of past cutover lands and wild land constitute important part of the policies aimed at increasing forest resources. In particular, in order to recover heavy damage to forest resources over a short period of time, one of the important forestation policies is to make a contingency plan and conduct it, including development of a necessary legal system. In this respect, there must be a significant value in analyzing the Japanese experiences during the 20 years following World War II.

2. Methods

The forestation problems, policies, and background of such during the 1940s and 1950s will be clarified using the literature and data, most of which are in government documents and statistics. Several documents of the Bureau of Natural Resource Section of the General Headquarters of the Allied Forces (GHQ), which occupied Japan during 1945-1952, were also used. The three major forestation policies, i.e., planting trees on cutover land, expanding the afforestation, and profit-sharing forestation, will be the focus here. The quantitative aspects of these policies will be discussed using national-level statistics. The current forestation problems caused by the forestation policies during the 20 years following World War II will be explained, and the problems with the forestation policies at that time will be discussed.

While forestation policies are also related to several forestry practices, such as nursery stocks and breeding, we will consider the policies directly related to planting trees. Thus, although the subsidy programs and public-financing systems are generally important on a practical level, they are not covered here. Postwar forestation policy has been conducted in a close relationship with the forest road system in Japan, but references to forest road policies will be minimal for the same reason. The main focus of this article is non-national forests[3], which constitute approximately 70% of the total forested area in Japan.

Traditionally, *cho* and *koku* were utilized as units of area and volume in Japan. The original statistical data were converted to ha and m^3, with the following conversion rates: 1 *cho* = 0.99174 ha and 1 *koku* = 0.2783 m^3. Thus, the approximate planning figures on forestation area or forest product supply and demand include broken numbers in ha or m^3.

3. Issues related to forestation

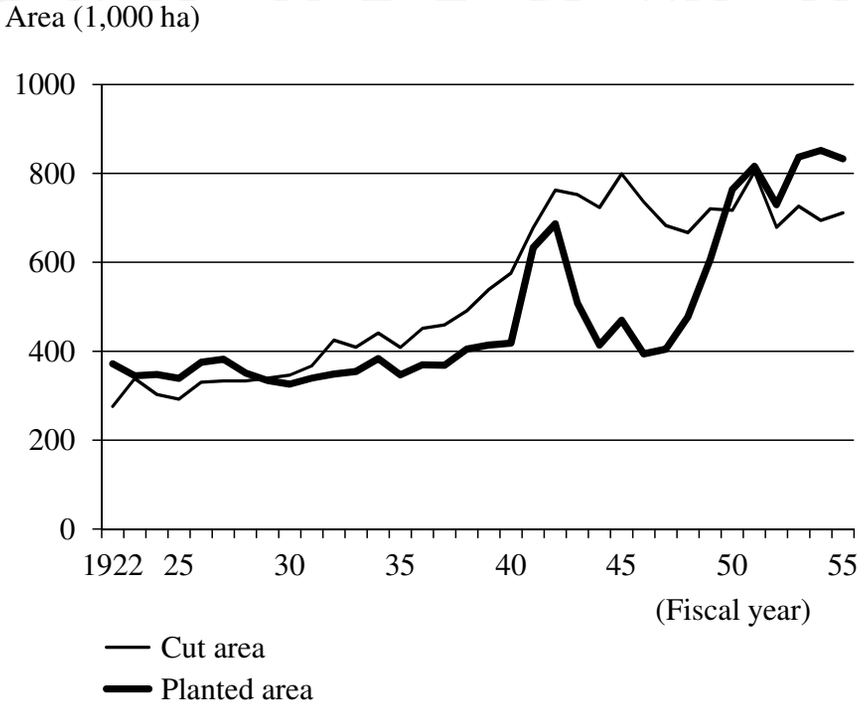
3.1. Divergence between cutting areas and forestation areas

Japan imported forest products before World War II; however, since the start of the war, importation had been generally difficult. The demand for forest products increased during

2 For English literature on Japanese forestation policies after World War II, see [37–38].

3 Forests are divided into three categories in Japan, classified by ownership: national forest, public forest (owned by local governments and so on), and private forest. Non-national forest includes public and private forests.

wartime. Figure 1 shows the cutting and forestation areas in the whole of Japan between 1922 and 1955. In this figure, the cut area includes all kinds of cutting methods, such as clear-cutting and selection cutting, and the forested area is the total planted forest and natural regeneration; thus, the difference between the cut and planted areas is not always the cutover land. However, the cut area was clearly greater than the planted area around 1945. Notably, the divergence between cut and planted areas had begun in the 1930s, when there was a worldwide recession; thus, the economic conditions of many farmers worsened and some cut their trees without following reforestation [2].



Source: [3, 4]
Note: Cut area is the total area cut using all kinds of cutting methods, including clear-cutting, selected cutting, shelterwood cutting, and final cutting of fuelwood forest, composite forest, bamboo forest, and other types of forest.

Figure 1. Cut and planted areas.

The cut area had almost doubled by 1940 from that before the war, and the planted area almost doubled in the 1950s. Thus, in the 1940s, forestation activities did not catch up with a rapid increase in cut area. The planted area temporarily increased in 1941 and 1942 owing to a sufficient national budget for forestation programs associated with a national ceremony[4]. Then, the amount of planted area decreased again, mainly due to the lack of a labor force in the farming and mountain villages [5]. Additionally, the planted area remained low during the inflationary period just after the war ended in 1945, and Nihon Ringyo Gijyutsu Kyokai reported nine reasons for this, as follows: lack of planting motivation due to economic

4 In 1940, the Kigen 2600-years Memorial Event was conducted, and planting activities continued with public cooperation across the country [10].

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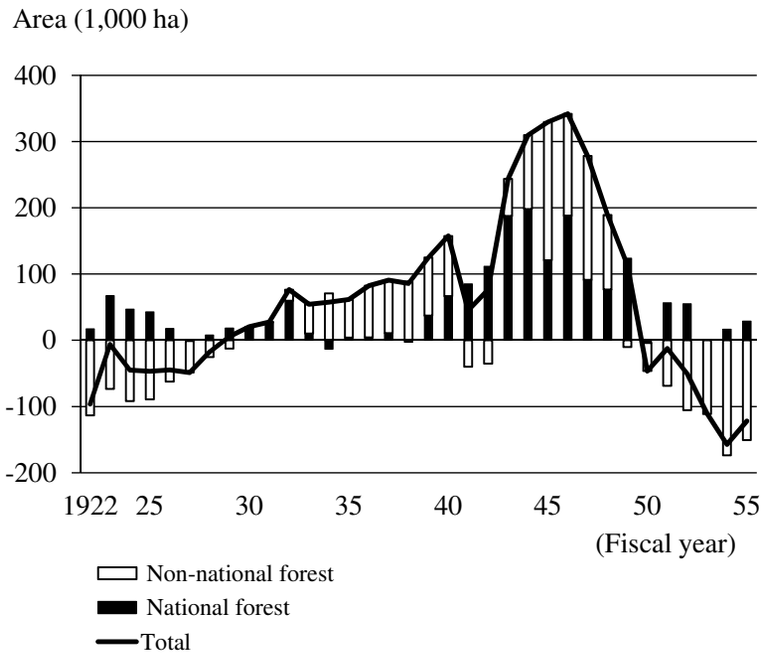
instability, rapid increase in planting costs, anxiety over forest ownership in relation to the agricultural land reform, cultivation problems, lack of nursery trees, lack of labor and related materials, lack of food, lack of money, and the forest tax [2].

The cut area was larger than the planted area during 1929-1949. The excess-cut area (subtracting planted area from cut area) is shown in Figure 2, where the national and non-national forests are divided. The line in the figure is the excess-cut area. Excess cutting occurred in national and non-national forests. The total annual excess-cut area during 1922-1955 was 2.79 million ha, including 1.44 million ha of national forests and 1.36 million ha of non-national forests. Excess cutting occurred earlier in non-national forests, and it occurred in national forests mainly around 1945. Excess-cut areas have disappeared in non-national forests since 1950 due to governmental forestation policies.



Source: [3, 4]
Note: Data was calculated by subtracting the planted area from the cut area.

Figure 2. Annual gap between cut and planted areas.

3.2. Large area of cutover land

Large areas of cutover land emerged throughout Japan around World War II, when annual cut area exceeded annual planted area, reaching approximately 1.49 million ha, including national and non-national forests[5] at the end of 1948 [2]. This area represented approximately 6% of the total forest area of Japan. In particular, trees in optimum locations tended to be cut, and the ratio of cutover land was generally highest in forests near villages. Several severe

5 This estimate includes all cutover land (1.38 million ha) and any other land necessary for planting, such as treeless land, forests with a small number of trees, or wild land.

typhoons damaged these areas, and there were growing concerns about forestation. Planting of trees on cutover land at the earliest possible opportunity was the starting point of the postwar forestation policies in Japan.

The largest segment that needed forestation was that of non-national forests. The Forestry Agency announced that the cutover land area totaled 1.71 million ha, including national forests (0.31 million ha), non-national forests (1.36 million ha), and public forests where forestation was planned by the government (0.04 million ha) [6]. The breakdown for non-national forests is shown in Table 1 [6]. The percentage of forested area that needed to be forested was 8.1% of the entire country, but the percentage had area differences, which were >10% in Hokkaido and Cyugoku. There is almost no difference by holding size for private forests. Notably, the percentage of forested area that needed to be forested was high at the time, regardless of area, ownership, and holding size.

			Total forest area (A) (1,000 ha)	**Forest area necessary for forestation (B) (1,000 ha)**	**Ratio (B) / Total (%)**	**Ratio (B) / (A) (%)**
Area	Hokkaido		1,981	235	17.2	11.9
	Tohoku		2,504	183	13.4	7.3
	Kanto		1,150	77	5.7	6.7
	Koshinetsu		2,421	129	9.5	5.3
	Tokai		1,750	94	6.9	5.4
	Kinki		1,724	170	12.5	9.9
	Cyugoku		2,148	235	17.2	10.9
	Shikoku		1,226	84	6.1	6.8
	Kyusyu		2,026	157	11.5	7.7
	Total		16,931	1,364	100.0	8.1
Ownership	Prefectural forest		914	49	3.6	5.3
	Municipal forest		3,217	324	23.7	10.1
	Private forest	less than 1 *cho*	1,938	152	11.2	7.9
		1-5 *cho*	3,249	245	18.0	7.5
		5-20 *cho*	3,122	260	19.1	8.3
		20-50 *cho*	1,557	130	9.5	8.3
		50 *cho* and over	2,934	204	15.0	7.0
		Subtotal	12,799	992	72.7	7.7
	Total		16,931	1,364	100.0	8.1

Source: [6]

Note: 1 *cho* = 0.99174 ha

Table 1. Forest area in non-national forests that needed to be forested (fiscal 1948).

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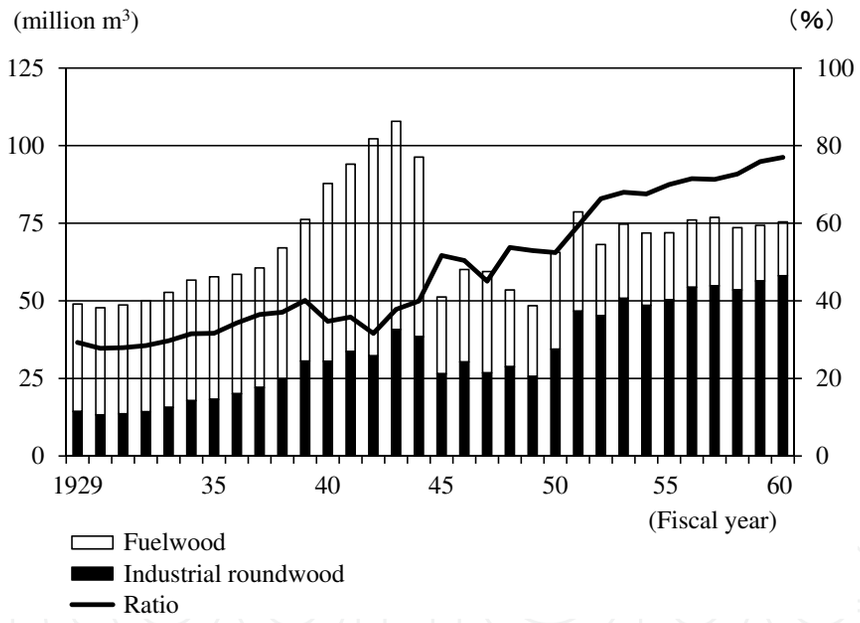
3.3. Divergence between cut volume and growth

Cut volume increased rapidly during the 1930s and 1940s when the cut area was larger than the planted area. The annual cut volume after 1929 is shown in Figure 3. The increase in cut volume during wartime was evident. Cut volume decreased briefly during the latter half of the 1940s. The percentage of industrial roundwood cut volume of the total cut volume tended to increase during the 1930s-1950s.

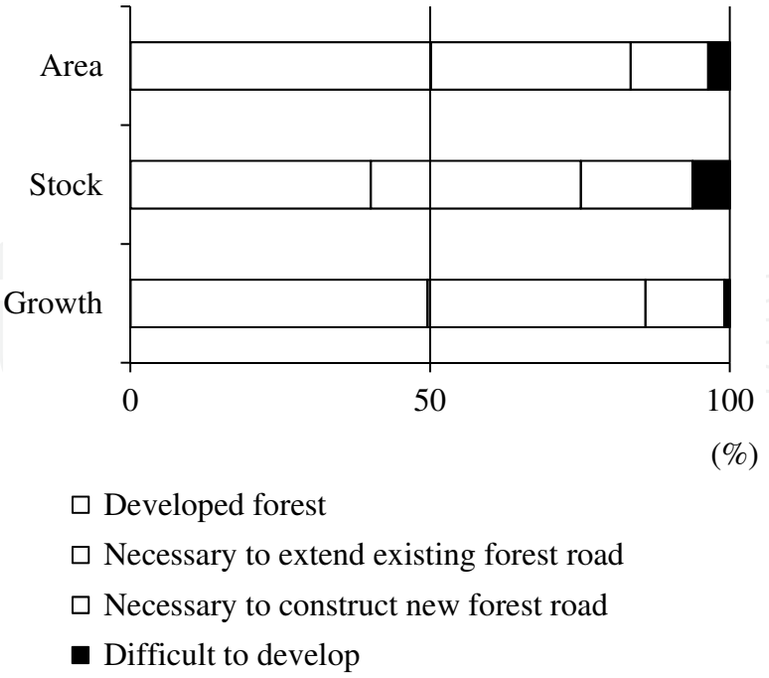
An important comparison is between annual cut volume and annual growth. The data on stock and growth at the time need to be assessed for accuracy because the evaluation was conducted over a short period and under serious financial constraints. In this sense, the growth data provide a sort of reference. Based on the forest resources summary table (1951 for non-national forests and April 1952 for national forests), the growth of coniferous trees was 22.8 million m^3, that of broadleaved trees was 23.9 million m^3, and the total was 46.8 million m^3 in the beginning of 1950s [7]. Growth during the first half of the 1940s, when cut volume was approximately 100 million m^3, is unknown, however, based on the growth in the early 1950s, it is certain that cut volume was larger than growth.



Source: [7, 8]

Figure 3. Cut volume and percentage of industrial roundwood.

A comparison between cut volume of industrial roundwood and growth of coniferous trees would be appropriate, as most industrial roundwood have originated from coniferous trees in Japan. The cut volume for industrial roundwood was at a minimum in 1949 at 25.7 million m^3, but this minimum figure was more than the annual growth of coniferous trees in the whole of Japan at that time. Considering the accessibility, the coniferous forest resource actually available was even smaller. The Forestry Agency estimated the industrial roundwood forest resource, classified by accessibility, in December 1950 [7]. The Forestry Agency divided forests



Source: [7]
Note: As of December 15, 1950.

Figure 4. Area, stock, and growth of coniferous forests.

for industrial roundwood into four categories based on accessibility, and the percentage of each category for area, stock, and growth are shown in Figure 4. In this estimate, approximately half of the growth was available. Therefore, the divergence between cut volume and growth of industrial roundwood was high at that time.

3.4. The dearth of domestic wood crisis

A potential dearth of domestic forest resources was a serious concern following the war due to the long-term forest practices of cut volume exceeding growth, delayed planting after clear-cutting, and the increase in wood demand. Huge amounts of wood were necessary to construct buildings, including wood houses, and to conduct civil engineering projects for war damage reconstruction. The potential dearth of domestic wood was predicted by several reports as follows.

In 1950, the GHQ of the Allied Forces reported that industrial roundwood would be exhausted within 15 years [9]. Another study by the GHQ noted that coniferous wood would be exhausted within 20 years[6] under the following conditions: available coniferous tree resources of 318 million m^3 on a log basis at the end of 1947, and the growth rate of 2%7.

Nihon Ringyo Gijyutsu Kyokai announced in a domestic report[7] that wood stock would be exhausted in 33 years under the following conditions[8]: available stock of 757 million m^3,

6 This is based on "Forestry" of volume XIV (Natural Resources, Part C) of "History of the non-military activities of the occupation of Japan, September 1945 – January 1951," and the cited page is page 63.

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including unutilized forest resources located in remote areas, annual required standing trees of 33 million m^3, and annual growth of 19 million m^3 [2]. Shinrin Shigen Sogo Taisaku Kyogikai calculated that industrial roundwood already developed would be exhausted in 16 years and fuelwood would be exhausted in 10 years [10].

Various calculations were made and published as to when domestic forest resources would be exhausted.The conclusions were the same; namely, the domestic forest resource would be exhausted under the remaining stock and the trend in wood demand. Such estimates impacted subsequent forest policies to some extent, including the necessity for controlling cutting activities in non-national forests, which was an issue in the amendment of the *Forest Act* 1951. Effective utilization of forest resources and an increase in coniferous forest resources through forestation represented target issues of forestry policy to prevent a lack of domestic wood.

3.5. Effective utilization of forest resources

Effective utilization of forest resources was necessary given the existence of a large cumulative cutover land area in Japan at the time. The movement to effectively utilize forest resources started around 1951 [11]. Yokoyama, director general of the Forestry Agency, pointed out several ways to address the imbalance between supply and demand, including recovery of damaged forest, development of remote unutilized forest, limiting consumption of forest products through effective utilization, and importing forest products [12].

As shown in Table 2, the Forestry Agency provided concrete methods for the effective utilization of forests and the efficient use of forest products [13]. The measures fell, basically, into four categories: substituting other materials for forest products, efficient use of forest products, sophisticated utilization of hardwood, and extending the usable years of forest products. All of the forest utilization ideas listed in Table 2 involved the use of 25.8 million m^3, compared to the total consumption of industrial roundwood in the fiscal year 1951 of 31.9 million m^3 [8]. The issue of whether consumption of forest products decreased in the ways listed in the table was not as important as the fact that the Forestry Agency published such a list as a direction for forestation policy.

The proportion of wood utilized for construction of the total consumption is high, as traditional houses are built of wood in Japan. A policy to promote the construction of non-wood buildings was developed under the policy for the effective utilization of forest resources [14]. In 1950, the House of Representatives passed a *Resolution on Promoting Fireproofing of Buildings in Urban Areas*, which stated that new public building construction must be fireproof. In 1955, *Measures on the Effective Utilization of Wood Resources* was issued by the cabinet and included promoting the fireproofing of buildings. National and local governments were required to take the lead and set a good example in fireproofing buildings. A non-wood building construction policy

7 Kobayashi suggested the existence of another report from the Forestry Agency to GHQ, in which the coniferous forest would be exhausted in 12 years in non-national forest and all forest resources, including national forest, would be exhausted in 24 years [39]. The year it was published is uncertain.

8 Within these conditions, figures utilized on stock and growth are based on the report from the Forestry Agency to GHQ [2].

		(1,000m³)
Item	**Measures of effective utilization**	**Volume**
Change forest products to substitution materials	Utilization of cardboard for packing	1,252
	Utilization of iron poles, steel formwork, etc. for pit props	1,823
	Utilization of bamboo for pulp	50 and over
	Utilization of straw for pulp	334 and over
	Utilization of used paper for pulp	278
	Utilization of reinforced concrete for telephone poles	39
	Change car fuel utilizing charcoal to gasoline	6,818
	Change fuel in urban areas to gaseous fuel	1,344
	Increase production of briquette fuel	0
	Increase production of lignite	612
	Subtotal	12,552
Effective use of forest products	Instruction and promotion in utilizing thin saw blades	1,280
	Utilization of yarders for logging	278
	Establishment of fiberboard factory	1,392~3,479
	Utilization of scrap wood for pulp	250
	Utilization of pulp refuse	165
	Improvement of building construction	417 ~1,670
	Improvement of utilization of hearths and furnaces	3,715
	Improvement of techniques in charcoal production methods	2,054
	Instruction of improvements in combustion appliances	2,505
	Subtotal	12,057
Sophistication of utilization of hardwood		250 and over
Extension of durable years of forest products	By antiseptic treatment	557 and over
	By fireproof building	278
	By waterproof plywood	111
	Subtotal	946
Total		25,805

Source: [13]

Note: This table was prepared from the items and figures listed in [13]. When the original data included a range, the lower figure was used in the table.

Table 2. Wood savings by the measures for the effective utilization of forest resources.

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was introduced, and areas where the construction of wooden buildings was prohibited increased on the basis of fireproofing.

Household fuel consumption was the main issue addressed in a government advisory report by Shigen Chosakai [15]. Approximately 80% of household fuel was wood-based at that time, and consumption of fuelwood was associated with broadleaved tree cutting. As the quantity of household fuel consumed by each household was generally small, various species were used as fuelwood, and the actual consumption was unknown. Thus, no comprehensive measure was taken and the problem was ignored. However, the situation seemed even more serious with the population increasing and the living standards improving. The report advised the government that furnaces in rural areas should be improved and the supply of gaseous fuel to urban areas should be increased. As a result, a *Revised 1953-1957 5-Year Plan* to expand and improve town gas facilities was developed by the Ministry of International Trade and Industry, and it was planned that gas facilities would grow from 31.8% in 1952 to 39.9% in 1957.

4. Forestation policies

After the war, approximately 1.5 million ha of cutover land was left and there was a deepening sense of crisis because of the dearth of domestic wood and an increasing demand for forest products. In this section, the major forestation policies for non-national forests, developed by the Forestry Agency, will be described in almost chronological order. The initial policies concerned planting trees on cutover land. However, policies to increase the coniferous forest area were a focus for future self-sufficiency. A profit-sharing forestation system was promoted to increase the forestation area. The results of the policies related to forestation will be shown at the end of the section.

4.1. Planting trees on cutover land

The *Forest Resources Creation Act* (Act No. 52 of 1945) was enacted in 1945, and was a revision of the *Wartime Forest Resources Creation Act* (Act No. 35 of 1945). People purchased planting securities issued by the government at half price, and the government purchased the planting securities at face value after the planting was completed. Thus, this system constituted a substantial 50% government subsidy for planting. Money is usually paid after the work is completed in a subsidy system; however, people who wanted to plant could plant with half the necessary cash in hand under this act. This system ended in 1948 without much impact, mainly due to the high inflation just after the war.

The first full-scale planting plan after the war was the *5-year Forestation Plan* (1949-1953) that promoted planting of coniferous trees on the 1.5 million ha of cutover land area. The *5-year Forestation Plan* is shown in Table 3. The total planted area was scheduled to be 2.82 million ha over the five years.

Planting was necessary on newly cutover land that was added every year after the war, in addition to the previous 1.5 million ha of cutover land. Because of an insufficient budget, the actual work was limited to 60%-70% of the planned area [16].

The *Act on Forestation Extraordinary Measures* (Act No. 150 of 1950) was enacted to effectively promote this planting plan in non-national forests, and the effective period was five years. Prefectural governors could specify the sites to plant, and the governor could conduct profit-sharing planting when planting was not completed at a specified time [1]. Article 1 of the act shows the objectives and effects of the act. The objective was rapid forestation to conserve national land by growing forest resources. It was pointed out in the Act that the forestation subsidy, financial support, preparation of nursery trees, and other related policies must be completed and implemented to realize forestation. The target of this act was to support the rapid planting of the *5-year Forestation Plan*.

(1,000 ha)

	National forest	**Forestation by government in non-national forest**[1)]	**Non-national forest**	**Total**
Planting	197	23	1,646	1,867
Direct seeding	0	0	25	25
Natural seeding	572	0	312	884
Total	769	23	1,983	2,776

Source: [2]

Note: 1) Profit-sharing forest between government and non-national forests.

Table 3. Five-year Forestation Plan (fiscal years 1949-1953).

The *Forest Act* of 1907 (Act No. 43 of 1907) was completely amended in 1951 (Act No. 249 of 1951) and the forest planning system began, which included enforcement measures for planting under some conditions. Under the forest planning system, the prefectural governor implemented an annual plan, which included the forest sites to plant (Article 8, Paragraph 5) and the obligation of the forest owner to plant (Article 14). Such compulsory regulations were exceptional because there had been no obligation to plant outside the restricted forests in the Japanese system.

The number of locations and the area per location among the annual implementation plans made by prefectural governors during 1952-1956 are shown in Figure 5. The number of locations specified for necessary planting was >300,000 every year. The annual mean area per location was small (0.6-0.8 ha).

After the amendment of the *Forest Act* in 1951, the *10-year Forestation Plan for Non-national Forests* ("10-year Plan") was published in 1952 (planning period was 1952-1961). The total

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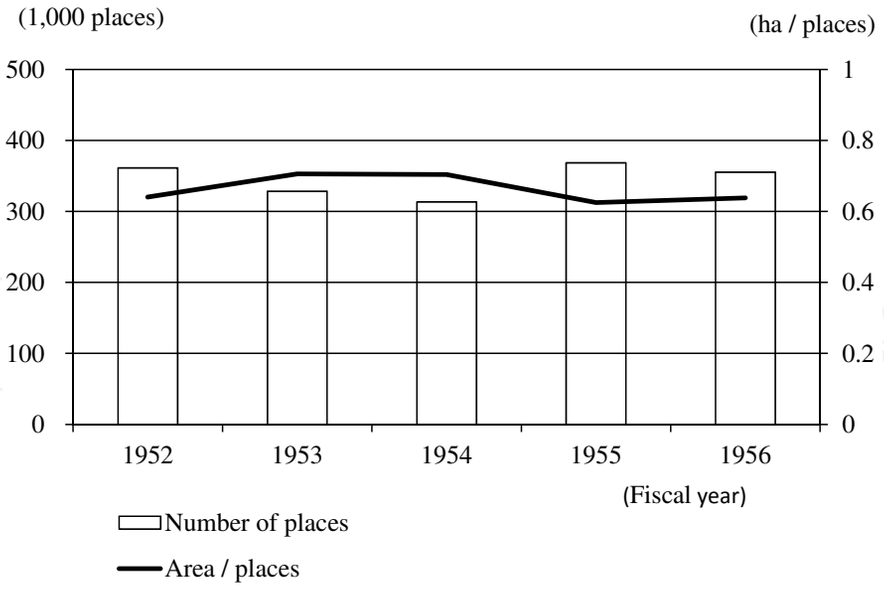

Source: [4, 17-20]

Figure 5. Areas specified as necessary to plant in the forest planning system.

planned forestation area is shown in Table 4. In addition to planting past cutover land, a new rule to replant immediately after cutting was established in the 10-year Plan. As annual cutting activities were necessary due to increased demand for forest products after the war, this new rule was significant, in order to prevent cumulative cutover land. The area to be replanted immediately after cutting was almost half of the total planted area. By planting coniferous trees after cutting broadleaved trees, coniferous forests were expected to expand by 0.8 million ha.

		(1,000 ha)
Category		**Area**
Planting	Past cutover land	879
	Cutover land of previous year	1,611
	Expansion of coniferous forest	838
	Subtotal	3,327
Direct seeding		50
Natural seeding		744
Total		4,121

Source: [16]

Note: The figures are the total forestation area during the 10 planned years. Numbers are the originally newly forested area.

Table 4. Ten-year Forestation Plan for Non-national Forests.

The final goal of the 10-year Plan was to achieve industrial roundwood self-sufficiency by increasing coniferous forest area [16, 21]. Of course, this final objective was an ideal at the time, and this goal was clearly different from that of the *5-year Forestation Plan* (1949-1953), which aimed to plant 1.5 million ha of past cutover land. However, the 10-year Plan was unachievable from the first year due to limited financial resources (the original 1952 budget was approximately 60% of the necessary budget). Regardless of the insufficient budget, reduction of subsidy rate in the fiscal 1954 budget plan made it possible to increase the planted area, and the annual planted area reached its highest level yet in 1954.

Reforestation of the protected forest system also contributed to increasing the planting area. The protected forest system, which is called *Hoanrin*, was introduced in the first *Forest Act* (Act No. 46 of 1897), and categories of the protected forest was expanded in the amended *Forest Act* of 1951. Reforestation of the protected forest was required by law. A new system was introduced in the 1951 amendment in which planting was firstly conducted and the area is specified as a protected forest after forestation. Several large typhoons and floods damaged[9] the whole country in 1953, and the *Act on Temporary Measures concerning Protected Forest Consolidation* (Act No. 84 of 1954) was enacted. The protected forest was promoted to extend according to the consolidation plan for protected forest.

A third plan called the *6-year Forestation Plan* ("6-year Plan") was introduced for the 1955[10]-1960 planning period. During this planning period, the non-national planted forest was scheduled to increase from 4.4 million ha to 6.0 million ha. Planting of coniferous trees after cutting broadleaved trees was emphasized in the 6-year Plan. Quantity was emphasized in the 10-year Plan for war damage reconstruction, whereas quality was emphasized in the 6-year Plan [21], such as utilizing high-grade nursery trees, introducing a seed tree system, and planting under the principle of the "right tree on the right site" [21].

Figure 6 shows the planted area in 1946-1957. The planted area was divided into three categories: planting after cutting, planting on cutover land, and planting coniferous trees after cutting broadleaved trees. The issue of overcut land, which had been a key forestry policy issue, was close to being resolved by 1956.

4.2. Planting coniferous trees after cutting broadleaved trees

After the success of forestation of cutover land, the main objective of forestation policy shifted to expanding the coniferous forest. In other words, the objective of forestation changed from the production of fuelwood to the production of industrial roundwood because the demand for broadleaved trees had decreased drastically as a result of the fuel revolution.

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9 Three powerful weather-related events damaged Japan in 1953 [40]. A flood occurred in the Kyusyu area in June. The number of missing and dead came to 1,014, and 3,231 and 11,671 houses were destroyed or half destroyed, respectively. A flood damaged the south Kinki area, mainly Wakayama prefecture, in July. The number of missing and dead came to 1,059, 424 houses were destroyed completely, 4,055 houses were washed away, 4,535 landslides occurred, and there were 106,738 victims. Typhoon no. 13 of 1953 hit in September, with 323 and 276 missing and dead, respectively. The number of injured came to 993 and 4,769 and 13,918 houses were destroyed or half destroyed, respectively.

10 The national forest system made a long-term production plan in 1955, emphasizing the planting of coniferous trees after cutting broadleaved trees. See [41] for details.

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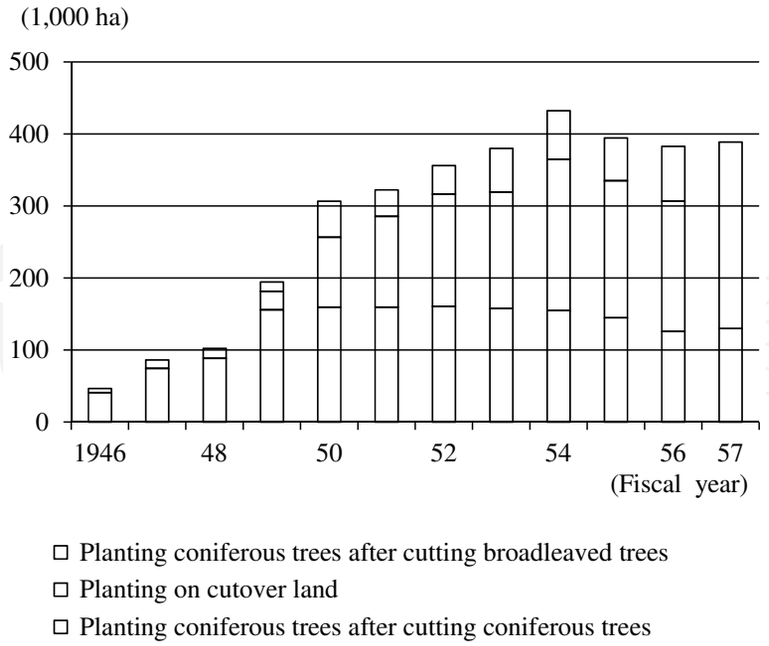


Source: [22]
Note: Total national forest and non-national forest area.

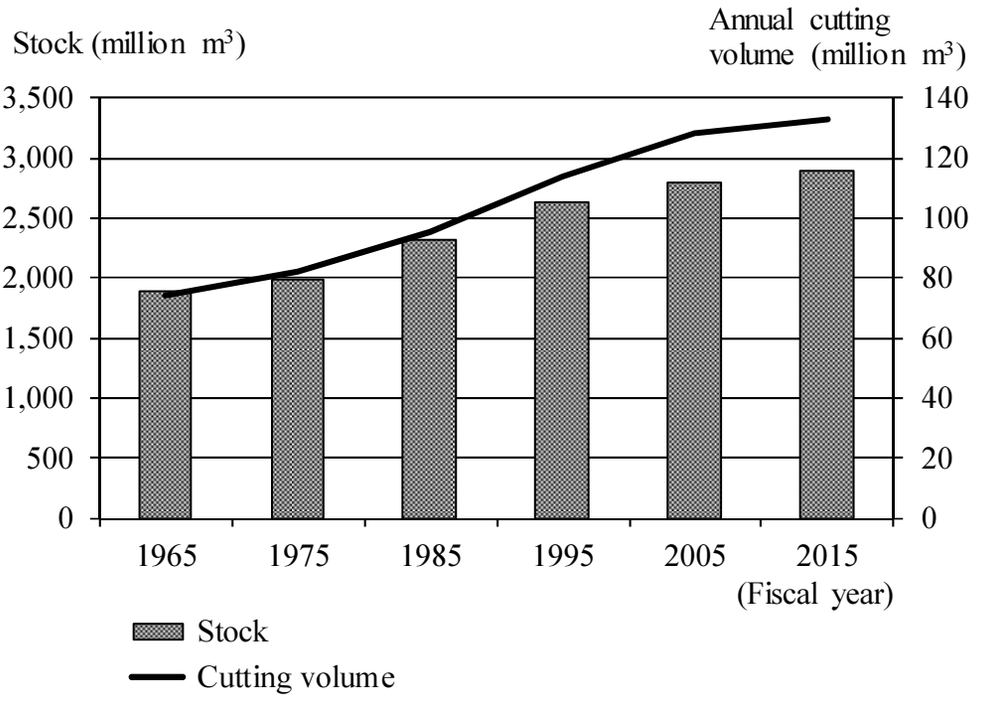
Figure 6. Planted area.

The following laws contributed to this expansion. The *Act on the Profit-sharing Planting Extraordinary Measures* (Act No. 57 of 1958) was enacted, which will be explained in section 4.3. The *Forestry Basic Act* (Act No. 161 of 1964) was enacted, and the main policy goals designated under Article 2 of the *Forestry Basic Act* were to increase forest products, forestry productivity, and forestry worker income. The total area of planted coniferous trees was included in the *Basic Plan on Forest Resources* of 1966 ("1966 Basic Plan"), which was the first plan decided on by the Cabinet under Article 10 of the *Forestry Basic Act* in 1966. The *Act on Advancement of Modernization of Rights in Relation to Forests Subject to Rights of Common* (Act No. 126 of 1966) was enacted, with the main purpose of foresting common forests[11] with coniferous trees.

The "1966 Basic Plan" provided the background for the coniferous forest expansion policy. The 1966 Basic Plan pointed out that although Japan had great potential for increasing forest resources, the current production capacity of industrial roundwood was low due to a lack of forestry roads. There was a concern that the Japanese wood supply and demand would be influenced severely if the low domestic production capacity and dependence on imported wood continued for a long period. It was concluded that actively enhancing domestic forest resources to increase forestry production was necessary. Here, a new logic appeared in the 1966 Basic Plan,which is to secure domestic resources in light of a possible worldwide imbalance in the supply and demand of industrial roundwood. The final goal was 13.4 million

11 See [42] for common forest management and the modernization policy on the rights of common forests in Japan.

ha of planted forest in 2015, which was 50 years after the planned year. The planted forest area was 7.7 million ha at the time the plan was introduced, and 5.7 million ha of new planting was necessary. The percentage of planted coniferous tree area of the total forested area was planned to reach 56% in 2015. The total stock and annual cutting volume were planned as shown in Figure 7.



Source: *Basic Plan on Forest Resources* decided by the Cabinet in 1966, Table 2
Note: The fiscal 1965 cutting volume was the 1962-1964 mean.

Figure 7. Planned stock and annual cutting volume for 50 years.

It was planned that the total stock would increase and reach 2,904 million m^3 by increasing the planting of coniferous trees. In the 1966 Basic Plan, the percentages of annual cutting volume to stock were planned to be 4.1% in 1975 and 1985, 4.4% in 1995, and 4.6% in 2005 and 2015. The percentage was planned to increase; the annual cutting volume was planned to increase to 133 million m^3 in fiscal 2015. As a reference, the actual annual cutting volume of standing trees was 36.5 million m^3 in fiscal 2012, which was substantially below the expected cutting volume in the 1966 Basic Plan. As will be shown later, the main reason was the too optimistic premise of the 1966 Basic Plan, which assumed that the Japanese economic development trend would not change and that the increase in wood demand would continue.

4.3. Profit-sharing forestation

Three resources are required to plant trees in a non-national forest: a forest site, planting labor, and funds for planting. Forestation of cutover land could be conducted by compulsory measures under the 1951 *Forest Act* until 1962. However, no compulsory measures existed for

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expanding the coniferous forest. The forestation fund was a main problem among the three resources. The planting would not occur without funding by forest owners, even if the subsidizing system and lending mechanism improved.

Various types of profit-sharing forestation began in the Edo Period in Japan, in which forest landowners and planters were differentiated and profits were divided between the landowner and the planter. The *Act on Planting on Public Forest by Government* (Act No. 7 of 1920) was enacted before the war and defined profit-sharing forestation between the government as the planter, and the municipality as the landowner. In a 1924 amendment of the act, it became possible for prefectural governments to plant forest land owned by municipalities and private owners in a profit-sharing system. This prewar profit-sharing system was only applied to the combination of public funds and non-national forests. In order to promote coniferous forest expansion, the *Act on Special Measures Concerning Profit-Sharing Forestation* (Act No. 57 of 1958), enacted in 1958,allowed various combinations of landowners and planters in the profit-sharing forestation system.

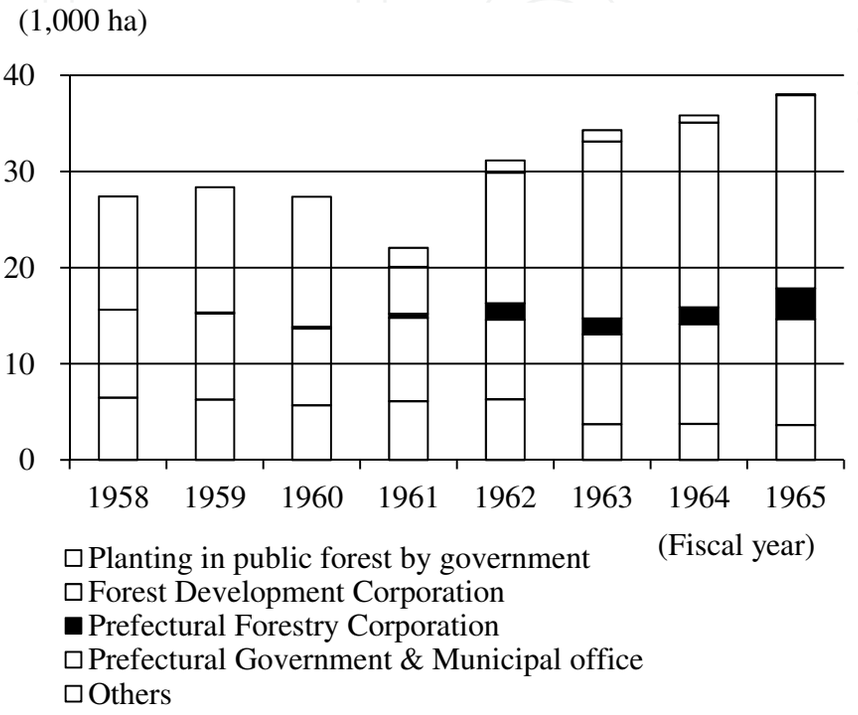
The introduction of private funds from, such as wood-related industries, including the paper and pulp industries[12], was a characteristic of the act of 1958 [1]. However, the area where forestation was actually conducted by means of a profit-sharing system utilizing a private fund was not very large. Forestation utilizing the profit-sharing system was supposed to be conducted on 506,000 ha by fiscal 1980 [23].

Prefectural Forestry Corporations and the Forest Development Corporation played important roles in the profit-sharing forestation system.

The first Prefectural Forestry Corporation was founded in 1959 in Nagasaki Prefecture, and by 1971 all prefectures had established their own Corporations. This organization planted coniferous trees, predominantly Japanese cedar and Japanese cypress, in non-national forests utilizing a profit-sharing system. According to a notification by the Forestry Agency dated April 1, 1965, concerning establishment of the Prefectural Forestry Corporation, the object of the corporation was to rapidly and systematically increase coniferous forestation in undeveloped areas, such as mountainous remote areas and isolated islands, and promote residents' welfare. According to a Forestry Agency administrative circular dated May 11, 1966, the working areas of the Prefectural Forestry Corporation were as follows: areas of poor geographical conditions, areas with a high percentage of broadleaved trees of low economic value, areas with a small number of forest owners who could plant, and municipalities with a high degree of dependence on forestry. Under the policy of the coniferous forest expansion the Prefectural Forestry Corporations were expected to conduct profit-sharing forestation at these poor-condition sites. The total area managed by Prefectural Forestry Corporations was 390,000 ha at the end of fiscal 2007.

12 The paper and pulp industries and the electric power companies were behind the enactment of the Act on Special Measures Concerning Profit-Sharing Forestation [43]. As the price of wood for pulp increased, the Ministry of International Trade and Industry placed a planting obligation on the pulp industries at the time of production facility expansion, and the paper and pulp industries developed a forestation plan. Electric power companies also had an interest in profit-sharing forestation in relation to hydraulic power generation.

The Forest Development Corporation[13] began a profit-sharing forestation program in non-national water source forests in 1961, located mainly in remote mountainous areas. The targeted forests were protected or future-protected forests, and the planted forest land was required to be >5 ha. The total area planted by the Forest Development Corporation is approximately 470,000 ha to date.



Source: [24, 25]

Figure 8. Areas planted through profit-sharing classified by planting organizations.

The area planted by 1958-1965 is shown as Figure 8. The public forest area planted by the government had clearly been reduced since planting by the Forest Development Corporation started. The percentage of Prefectural Forestry Corporations increased gradually. In 1965, the major three planters were the Forest Development Corporation, prefectural governments, and Prefectural Forestry Corporations.

4.4. Results of the forestation policies

The annual planted area is shown in Figure 9. The breakdown figures between the expansion of coniferous forests and other reforestation became available after fiscal 1960. The peak year for total planted area was fiscal 1954, and the annual planted area was >300,000 ha during 1950-1971.

13 The Forest Development Corporation was founded in 1956, following planting activities under the Act on Planting in Public Forest by Government of 1920. The original objective of the corporation was to develop national forest located in remote mountainous areas by constructing forest roads. This corporation was reorganized in 1999, 2002, 2008, and 2015, and is currently called the Center for Forestry Development, Forestry, and Forest Products Research Institute.

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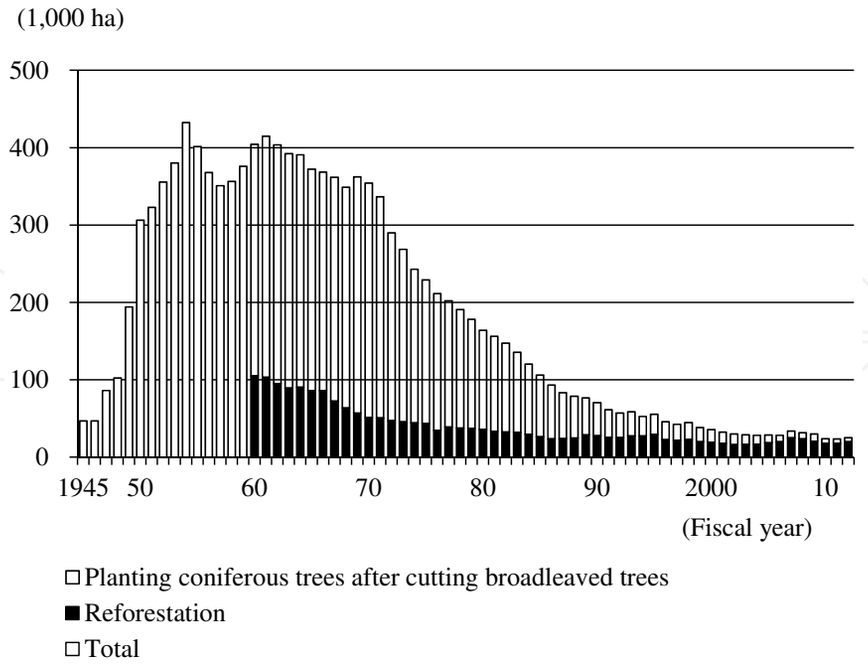

Source: [8, 26-29]
Note: Total national forest and non-national forest area.

Figure 9. Annual planted area.

Approximately 10 million ha of planted forests now exist in Japan as a result of postwar forestation policies, which is less than the targeted area of 13.4 million ha in the 1966 Basic Plan, and the major species are Japanese cedar and Japanese cypress[14]. The area of planted forests is approximately 40% of the total forested area and has a growing stock of 3.0 billion m^3. The total growing stock for the whole of Japan was 4.9 billion m^3 as of March 31, 2012. Annual growth was 74 million m^3 in 2010, including all forest resources in Japan, which is just slightly higher than the 72 million m^3 annual demand for wood in Japan. The forest resources that had decreased drastically before and after World War II have largely been recovered, at least concerning total stock.

5. Discussion

As a result of the forestation policies, the issue of cutover land, which assumed once the largest forest-related issue, was solved, and the crisis of the dearth of domestic industrial roundwood was prevented. Now, Japan has 10 million ha of planted forests, with an annual growth of 74 million m^3. Thus, the postwar forestation policies were successful. However, the intense planting conducted over a short period led to current forest policy issues. In this section,

14 The percentages of plantation forest classified by species are as follows: Japanese cedar 44.0%, Japanese cypress 25.5%, other coniferous trees 27.7%, and broad-leaved trees 2.8%.

current issues of Japanese forestry, which could be attributed to the past forestation policies, will be discussed.

5.1. Intense planting under the government's initiative

As coniferous trees were intensively planted over a short period after the war, the age structure of these forests became unequal. Many forests have now reached an age class that needs thinning, but the percentage of forests that have been thinned remains insufficient. Thinning, particularly in a stand >30-40 years, requires forest machinery and a forest road network, but these were not always available. In addition, there tend to be labor force problems due to aging forest owners, forestry workers, and village workers.

Postwar planting of trees, which included planting on cutover land and expanding the coniferous forests, was planned and conducted by national and local governments. Although this was the driving force to realize forestation, it has caused current forest management problems. Postwar forestation policies have connected public work projects with the forest planning system.

The relationship between public work projects, which started in 1946, and planting is explained. Planting, constructing forest roads, and conducting forest conservation projects were included among public work projects because these were related to national land conservation. Although there was a subsidy program for non-national forest planting activities before the war, based on the *Ordinance on Subsidy for Planting for Watershed Protection Forest* (1927) and the *Ordinance on Promotion of Planting* (1929), the government did not actively take the initiative in the planting activity. However, after the war the government has incorporated planting in the public work projects, and strongly promoted planting activities for land conservation in non-national forests.

Next, the relationship between planting and the forest planning system, which started under the 1951 amendment of the *Forest Act*, is described. All forest owners had an obligation to prepare a forest management plan under the previous system, based on the amendment of the *Forest Act* (Act No. 15 of 1939). The management plan was made individually if the holding size was >50 *cho* (almost 50 ha). Forest owners with forests of <50 *cho* had to join the local forest owner's association and the association would prepare a management plan. As above, local governments could supervise non-national forests through the forest management plan. However, this 1939 system failed to work properly during wartime and was discontinued in the 1951 amendment. Under the 1951 forest planning system, the Minister of Agriculture and Forestry had prepared a 5-year plan every five years, and the Prefectural Governor had also prepared a 5-year forest management plan every five years, as well as an annual plan. The basic difference between the prewar and postwar systems was that forest owners had to prepare the forest management plan in the prewar system, whereas the administrative sector prepared the forest plan after the war. In 1968, the forest management plan, prepared voluntarily by forest owners, was added.

Postwar planting projects developed based on strong national and local government initiatives, including public work projects, the forest planning subsidies, as well as subsidies and a

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public financing system. As a result, the forestation policy was aimed at timber production and national land conservation simultaneously. A considerable amount of planting was conducted without management strategies or forest practice plans by forest owners.

The profit-sharing coniferous forests targeted by the Forest Development Corporation were non-national water source forests located in remote areas. The Prefectural Forestry Corporations contracted profit-sharing planting in non-national forests located in remote areas where almost no one wanted to plant. In such remote areas, no planting would have been conducted due to economic reasons. Thus, it was clear that these administrative corporations had played a significant role. Administrative offices promoted the change from broadleaved forests, which were no longer required as a fuelwood source, to coniferous forests. A number of forest owners had no experience of cultivating coniferous trees, and simply followed the administrative advice.

Although planting and initial tending, such as weeding, were conducted through the initiative of administrative offices, thinning was required as the forests aged. Despite various efforts by national and local governments to promote forest practices such as thinning[15], forest owners tended not to thin or conduct the final cutting. Only a small number of motivated owners prepared forest management plans, without much support from the prefectural government or the local forest owners' association. This situation represents the background for the current forestry issues in Japan.

The compulsory procedure can be found among forestation policies in the 1951 *Forest Act*. The GHQ had basically abolished the compulsory wartime system, but forestation of cutover land was essential to national land conservation; thus, the compulsory policy measures were chosen. The compulsory characteristics were necessary for forestry policy in the 1940s, and to some extent in the 1950s, to maintain forest resources and avoid a crisis arising from a lack of domestic wood. However, such a compulsory approach was terminated after the cutover issues had ended. The forest planting site specifications, specified by the 1951 *Forest Act*, were removed in 1962, but the government-led forestation policies did not change. The government-led forestation program had continued, but the government should have considered about until when it would continue the program and how it would manage the planted forests in next decades. Neglecting these problems has brought about current forest management issues involving insufficient forest practices.

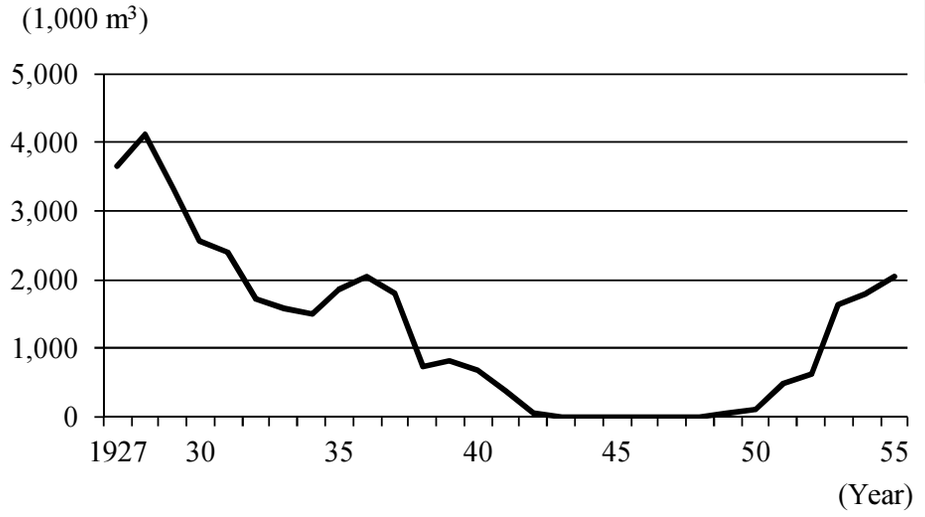
5.2. Industrial roundwood self-sufficiency

The dearth crisis of domestic wood was the main driving force for the postwar forestation policies. The situation that annual cut volume was more than that of growth caused the dearth of domestic forest resources in developed areas. The aspiration for self-sufficiency in industrial roundwood[16] originated from the wartime experiences. Figure 10 shows timber imports from

15 The Forestry Agency secured a budget for thinning associated with measures against global warming, based on the Act on Special Measures concerning Advancement of Implementation of Forest Thinning, etc. (Act No. 32 of 2008).

16 Various analyses on the future dearth of forest resources included both industrial roundwood and fuelwood. However, as fuelwood was expensive to import, it was not considered.

1927 to 1950. As the outbreak of war got closer, the quantity of imported timber decreased, and the percentage of imported timber was zero around 1945, until timber imports from Southeast Asia restarted in 1948. As timber imports were zero or very low at that time, the only way to supply industrial roundwood was from domestic forest resources. The 5-year Plan (1949-1953) was prepared when timber imports were zero. The 10-year Plan (1952-1961) and the 6-year Plan (1955-1960) were developed just after timber imports restarted.



Source: [10] (before 1945) and [30] (after 1946)

Figure 10. Timber imports.

However, timber imports at the time were considered a measure to solve the future dearth of domestic forest resources. GHQ also analyzed the Japanese wood supply and demand based on forest resources and wood consumption at the time. GHQ pointed out three choices: (a) insufficient supply indefinitely but on a sustained yield basis; (b) sufficient supply in the immediate future but ultimate forest bankruptcy; and (c) importation of nearly half of its timber and fuel needs (more as the population rises) to supplement sustained production [31]. GHQ suggested that about 28.3 million m^3 (1 billion ft^3) of timber should be imported, alongside the efficient consumption of forest products and improved forest management to enhance the growth of trees. It was also pointed out that such timber imports would not be a problem based on the domestic foreign currency reserve and international forest resources. Shinrin Shigen Sogo Taisaku Kyogikai reported that possible imports would be from Alaska, the USSR, and Southeast Asian countries [10]. The report suggested that repeated petitions through GHQ and Japanese government would be needed to import wood from Alaska. As revealed in these reports, it was already pointed out that timber imports would alleviate the crisis of the dearth of domestic wood.

Japanese timber trade policy promoted postwar imports. The tariffs on forest products were generally low, and tariffs for logs were dropped to near zero by a 1951 amendment, with the exception of some specific species, and tariffs on forest products were limited to sawn wood. The problem with importing timber was not the tariff, but the foreign exchange allocation

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policy; however, this exchange control for logs was abolished in 1960. Log imports increased immediately and the import of sawn wood increased recently. The wood self-sufficiency rate has fallen to be 27.9% in 2012 [32][17], although the postwar forestation plan targeted industrial roundwood self-sufficiency. It can be concluded that planted coniferous forest had expanded under the forestation plans, but that the plans had not affected domestic timber production. It seems that the forestation policy for self-sufficiency and the trade policy could be somewhat contradictory. A comprehensive analysis of the policy contradiction remains for future research.

5.3. Financial issues of the Prefectural Forestry Corporations

All the Prefectural governments founded a Prefectural Forestry Corporation ("Corporation") to promote the planting of coniferous trees in non-national forests using a profit-sharing system. Forest owners prepared only forest sites, the Corporation supplied money, and the idea was that the revenues from final cutting would be divided between the forest owner and the Corporation in a contracted proportion. An important characteristic of the Corporations is that profit-sharing forest management was conducted utilizing long-term debt[18]. All costs of planting, tending, thinning, forest road construction, wages, redemption money, and interest, were supposed to be paid from long-term debt. When the organization was founded, it was expected that the amount of long-term debt would be less than the revenue from final cutting.

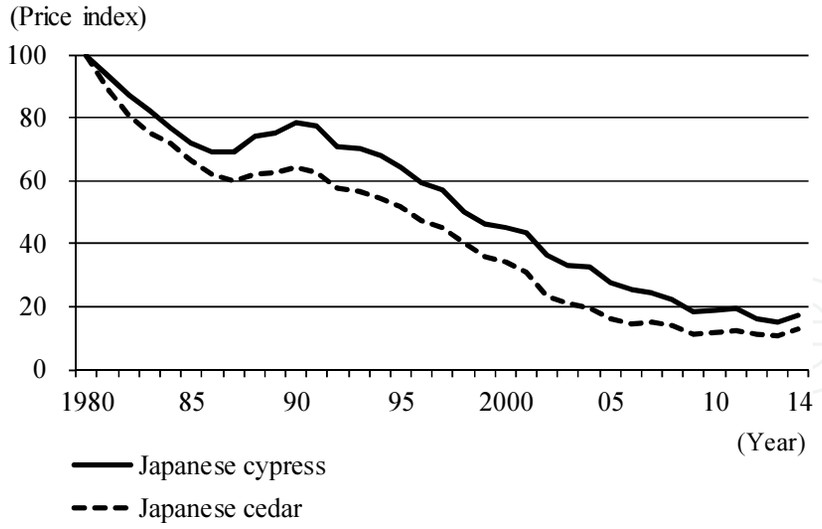
However, a deficiency in future assets was certain for all prefectural corporations. All Prefectural Forestry Corporations have long-term debt of approximately 8.7 billion USD[19] in total, which has become a political issue in all prefectures. Some prefectural corporations have dissolved or have been integrated into the prefectural forest system, or have altered their long-term forest practice contracts. The basic problems related to this financial failure of a Corporation are discussed below.

The first thing to be pointed out is the fact that the Corporation failed to predict log price changes or was too optimistic. Japan was in the middle of a strong economic growth when many of the Corporations were founded. The demand for industrial roundwood and the price of logs were increasing. Such economic conditions provided a precondition for promoting planting policy by founding the prefectural corporations. The 1966 Basic Plan, as shown in section 4.2, was the most basic forestry plan, and the future prospects of forest resources and the long-term prospect of supply and demand for industrial roundwood were estimated under the precondition that timber prices would never change. However, the upward trend in domestic log prices was reversed to downward because of low economic growth, a decrease

17 The minimum forest product self-sufficiency rate (18.2%) was recorded in 2002 but the rate has been increasing gradually since that time.

18 The Corporation provided finances from planting subsidies (approximately 30%), debt from the Agriculture, Forestry, and Fisheries Finance Corporation (AFC; currently the Japan Finance Corporation) (approximately 60%), and debt from prefectural governments (approximately 10%) [43]. The Corporation could easily collect funds from the AFC because the AFC debt was guaranteed by the prefectural government, indicating that the long-term debt of the Corporation could turn out to be the cost the prefectural government must finally bear.

19 1.04 trillion yen was converted to USD at a rate 1 USD = 120 yen.



Source: [29, 33]
Note: Price index was considered to be 100 in 1980, when the highest price was recorded. (As of March)

Figure 11. Stumpage price.

in population growth, decreased housing construction, and increased imports of log and sawn wood. The most drastic change in price was the stumpage price as shown in Figure 11.

Prices for Japanese cedar and Japanese cypress, which are the typical planted coniferous species, have changed to a declining trend since 1980. The price index (1980 = 100) bottomed at 10.9 for Japanese cedar and 15.1 for Japanese cypress in 2013, and the downward trend in price almost stopped. Due to the drastic drop in log prices, revenue from thinning and future final cutting would also decrease greatly, and total revenue could be less than total cost. The Corporations made efforts to extend the final cutting age as a practical measure because no profits would be made at the scheduled final cut age under the long stagnating log price. However, extending the final cutting put off the time when Corporations could collect revenue. The Corporations did not predict such a long-term decline in log prices, and resulting various management issues.

The second problem is that total costs included not only actual costs of planting and tending, but also debt interest and general administrative costs. Figure 12 shows an example of the financial conditions of a Corporation, where the funds invested were divided into actual costs plus administrative costs and interest[20]. The interest percentage has become large in recent years to be >90%. The interest percentage of the total costs during fiscal 1966-2012 without considering the discount rate was 46.4%. Planting activities of this Corporation started in fiscal 1966 and ended in 1998, and since then the Corporation has managed forests planted previously.

20 The detailed actual conditions on the interest of the long-term debt of the Corporation were not open to the public. The case of borrowing from the AFC in the Iwate Prefectural Forestry Corporation was as follows: in the case of subsidized forestation, the simple interest rate was 4.2%, 6.05%, 6.2%, and 6.5%, the repayment grace period was 25 years, and the redemption period was 40 years [43]. In the case of unsubsidized forestation, the simple interest rate was 3.5%, the repayment grace period was 25 years, and the redemption period was 45 years.

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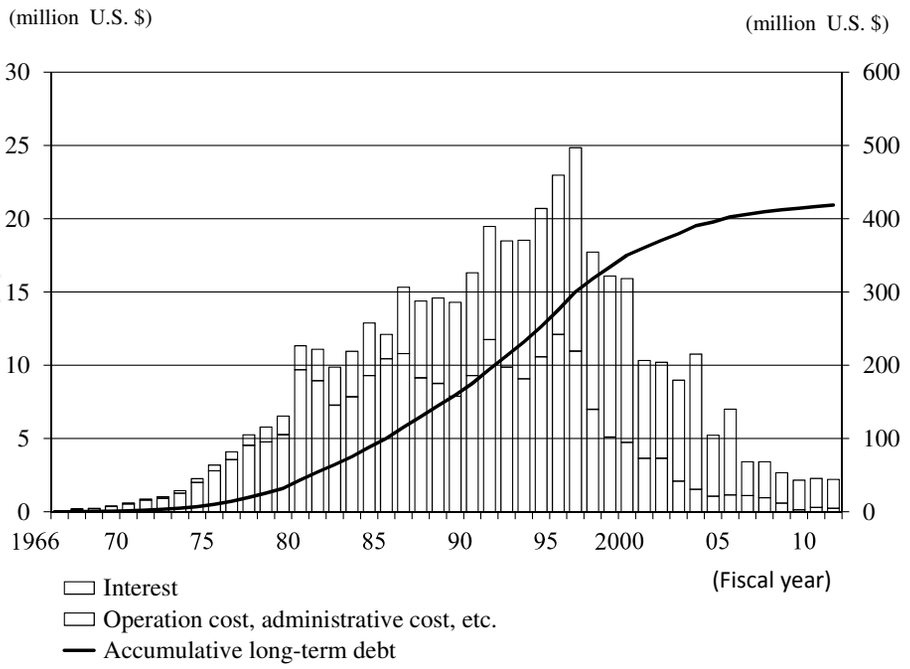

Source: [34]
Note: Total area planted by this corporation was approximately 16,000 ha. Values are converted using 1 USD = 120 yen.

Figure 12. Financial figures on a Prefectural Forestry Corporation.

The management system in which all necessary costs are paid by long-term debt was problematic, given that it takes 40-50 years to produce industrial roundwood in a managed forest. In fact, no revenue was collected from the forest during the 40-50 years after founding the Corporation, except revenue from thinning, which is generally very small or nothing. As a result, interest must have been paid by additional long-term debts. It is unclear whether such a financial problem involved in the management system of the Corporation was completely understood by the stakeholders, and this remains a future research topic. The final goal of planting coniferous forested area was the priority of the 1966 Basic Plan and the forestation policies at the time. It was a serious problem that the finances were completely lacking for the organization to expand coniferous forests based on the national policies.

When log prices started to fall in 1980, people probably expected a price rise again, because the postwar prices of logs and forest products had tended to increase. However, as the downward trend in stumpage has continued over the past 30 years. As for the corporation shown in Figure 12, if it had conducted a fundamental financial reform in the 1980s, it could have avoided some of the accumulating debt. There was little concern about the finances of the local organizations conducting forestation under the national policies at that time.

Although the Corporations have definitely contributed to increasing the area of planted coniferous forests on non-national forest land, their financial failure is obvious. The issues of the Corporation show that forestation policy must be associated with financial policy[21] for long-term forestation investment.

5.4. Forest resource statistics

The first goal of postwar forestation policy was planting trees on cutover land, which was clearly urgent for conserving national land. As shown in section 3.4, the statistical estimates from several calculations suggesting the future dearth of domestic industrial roundwood was the starting point of the policy to expand coniferous forests. Many problems were detected in the calculations made at the time.

Several different estimates were made as to when domestic industrial roundwood would be exhausted, on the basis of available stock, annual growth, and annual cut volume. Correctly estimating stock and volume is generally difficult; thus, an inadequate estimate may have been unavoidable. However, Japan has never actually faced exhausted domestic forest resources.

Kondo criticized the stock and growth estimates for three reasons [35]. First, the calculations assumed that forests located in high mountainous areas and protected forests were unavailable for harvesting. Protected forests were not generally exempt from all cutting activities. Second, he pointed out that the stock of utilized forests was underestimated and that of unutilized forests was overestimated. Third, underestimates of old-aged forests were pointed out. Given the conclusion that the stock available should be larger than the published estimate, Kondo argued that no crisis of domestic forest resources would occur if forest land reform was carried out at the same time. Kondo also pointed out that one of the reasons why the government underestimated forest resources was to stretch forest roads in remote areas.

Among the critical opinions about the calculations regarding the dearth of forest resources, the importance of an appropriate estimation of the forest resources was identified. One of the basic conditions for estimating forest resources was an accurate assessment of the forested area. However, the actual forested area is often larger than the registered area[22] even now, due to a lack of forest land survey data owing to delays in national land surveying. The percentage of surveyed land in the whole of Japan was only 41% at the end of fiscal 2009 [44]. There still remains the serious problem of vast forest area being left unsurveyed.

Given that the dearth of forest resources in the utilized forests is forecasted, when the exhaustion occurs depends on how to define the utilized forest. Furthermore, the area of the utilized forest is changeable with various logging methods and different timber prices. Bearing in mind these factors, the estimate of utilizable forest resources tended to be arbitrary.

In addition to the difficulties involved in defining a utilized forest and evaluating the stock, another problem at the time was the fact that the growth rate was unclear. Shinrin Shigen Sogo Taisaku Kyogikai estimated the number of years until exhaustion to be 33, 46, and 60 years for growth rates of 2.45%, 3.5%, and 4.0%, respectively [10]. It is obvious that efforts to estimate growth rates of the planted forests are required now.

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21 It was problematic that the repayment grace period in the AFC was 25 years, which was shorter than the final cutting age. As no fund was available to the Corporation at the time they were founded, the interest was assumed to be paid by additional loans as a result of such a short repayment grace period.

22 Mokuzai Shigen Riyo Gorika Suishin Honbu reported that the actual area of forested land was two to five times greater than the area written in the land register [11]; thus, the actual stock was considerably larger than the published data.

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For example, if stock is underestimated and domestic supply is overestimated, the time to exhaustion would be short, or if stock is overestimated and domestic supply is underestimated, based on overestimating imported timber, there would be no timber shortage. Correct estimation of forest resources, and the forest product supply and demand, still remains important today. At the same time, it is necessary to understand that such estimates can be somewhat arbitrary and that a comprehensive review of past estimates should be conducted.

6. Conclusions

The first major postwar forestation policies were developed as a way to decrease the area of cutover land. These policies were followed by introducing temporary enforcement measures under the forest planning system. Following this, national and local governments prepared forestation plans and related legal systems to increase the planting of coniferous forests, and strongly promoted policies with the same goal by founding planting organizations; policies for a subsidy system were also developed. As a result of policies, the total volume of Japanese forest resources has recovered. However, cutting activities are generally weak, although many of the planted forests have recently reached the final cutting age. In addition, large debt has been incurred by the Prefectural Forestry Corporations. We are facing serious forestation problems today which are different from those experienced just after the war. It is time to discuss how to manage approximately 10 million ha of existing planted forest in a new way.

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