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Examination of Social Factors Affecting Private Forest Owners' Future Intentions for Forest Management in Miyazaki Prefecture: A Comparison of Regional Characteristics by Forest Ownership Size

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Abstract: Although Japan's planted forest resources are mature, efficient timber production and reforest postharvest are hindered by the small-scale forest ownership and private forest owners' (PFOs') low willingness to engage in forest management. A New Scheme of Forest Management (NSFM) has been established under which Japan's municipalities can aggregate forest management rights which PFOs with low future intentions for forest management. Therefore, this study explores the socioeconomic factors that determine PFOs' future intentions for forest management and examines NSFM challenges. PFOs were surveyed via questionnaires in two regions of Miyazaki Prefecture with different forest ownership sizes. The results showed that forest size and the presence of successors affect PFOs' future intention for forest management. In addition, PFOs with low future intentions were less aware of their forests, and their forests were the source of reforest abandonment. Although aggregating forest management rights of PFOs with low future intention by the municipalities may contribute to sustainable forest management, the increased workload on municipalities is a challenge. Overall, accessibility to sufficient decision-making information is a prerequisite for evaluating PFOs' future intention to manage their forests.

Keywords: New Scheme of Forest Management; Forest Management Law; private forest; small-scale forestry; typology of forest owners; Japan

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1. Introduction

In Japan, planted forests cover 10 million ha or approximately 40% of the 25 million ha of the forest area, of which 65% are privately owned [1]. The planted forest resources, it is mainly converted from primarily broadleaf forests to conifer forests Japanese Cedar (*Cryptomeria japonica*) and Japanese Cypress (*Chamaecyparis obtusa*), which were established after World War II have matured; half of them are over 50 years old and are now in their utilization period. Notably, the amount of timber produced increased from 15.1 million m^3 in 2002 to 31.2 million m^3 in 2020 [1]. However, the Forestry Agency has found that the log supply from clearcutting is approximately 40% of the growing volume of planted forests accumulated, indicating that the resource must be utilized more efficiently.

The Japanese government has promoted forestry promotion policies, including the revision of the Forestry Basic Law in 1964, in response to the declining profitability of the domestic forestry industry against the backdrop of the strong yen and increasing timber imports [2]. Aggregating small-scale forest stands have been promoted as a policy measure to improve operational efficiency and reduce timber production cost in Japan, where the majority of forest owners are small-scale private forest owners (PFOs) [3]. However, as planted forests matured and entered the harvesting stage, further aggregation of forest

management was required. In 2019, the Forestry Agency has started a "New Scheme of Forest Management" (NSFM) to solve the following problems: the low willingness of PFOs to manage their forests, the disparity between the intentions of PFOs and forestry managers to expand the scale of their operations, the slow introduction of road network maintenance and high-performance machinery, and low productivity. The small-scale ownership of forest conditions is a major obstacle to efficient timber production, as 74% of forest areas owned by PFOs are less than 5 ha [4]. The NSFM ensures the following: (1) A growth industry is compatible with proper forest management, (2) aggregation of forest management rights, not including ownership, to highly motivated and sustainable forestry enterprises, and (3) improvement conditions for aggregation of forest management [4]. As part of this effort, in 2018, the government enacted a Forest Management Law to achieve effective timber production and appropriate forest management by aggregating forest management rights. Specifically, this law stipulates that PFOs must manage their own forests and are responsible for harvesting, silviculture, and nursery at the appropriate times. It also allows PFOs to entrust forest management to the municipality in accordance with PFOs' future intentions. Forests suitable for forestry management are re-entrusted to forestry enterprises from the municipality according to their economic values, whereas the municipality manages those that are unsuitable. Thus, the NSFM is based on PFOs' willingness to manage their forests in the future, and municipalities survey PFOs' intentions to ascertain their willingness to do so. The survey selection criteria included planted forest owners without a forest management plan and forest management that had not been implemented for the past decade.

The Forest Environment Transfer Tax (FETT) allocation began in 2019 in Japan as a financial resource for municipalities and prefectures that will be directly responsible for NSFM. The FETT amount allocated to municipalities is calculated as follows: 50%, 20%, and 30% of the municipality allocations are based on the area of private forest plantations, forestry worker population, and municipality population, respectively. The area of privately planted forest is corrected according to the forest area ratio, with 1.5 for municipalities with a forest area ratio of 85% or more and 1.3 for municipalities with a forest area ratio of 75% or more but less than 85%. Notably, the criteria for determining the allocation amount deviate from the system's intention [5]. As FETT has only been operational for a limited time, system evaluation is a future concern. However, the actual situation regarding tax utilization is being assessed for prefectures [6] and large cities [7], prefectural support for municipalities [8,9], urban–rural partnerships [10]. In addition, Ishizaki et al. [11] mentioned the increased workload of municipal officials on the NSFM and the FETT administration.

The Forest Management Law, which directs the future management of the PFOs' forest according to the PFOs' willingness, may promote immediate timber production and forest improvement. However, because the transfer of rights related to the property rights of PFOs must be done cautiously, the development of PFOs willing to manage their forests must be balanced with the smooth aggregating forest management rights from PFOs unwilling to manage their forests. Clarifying the factors that influence future management intentions is thus necessary when considering the maintenance or enhancement of PFOs' willingness to forest management.

Effective forest policy implementation requires identifying the determinants of PFOs' decisions [12] and developing forest policies that can influence PFOs' behaviors [13]. Forest owner typologies are being utilized to develop a method for identifying forest owner values [14]. The typology studies are mostly based on ownership objectives [15]. Previous studies noted that forest owners could be divided into five types: "economist," "multiobjective owner," "recreationist," "self-employed," and "passive owner," based on the purpose of their forest ownership [12,13]. Boon et al. [12] classified the Danish PFOs into three types: "classic owner," "hobby owner," and "indifferent farmer" based on a survey of PFOs' interest in forests. Ingemarson et al. [13] classified the Swedish PFOs into five types: "traditionalist," "economist," "conservationist," "passive," and "multiobjective," according to the purpose of ownership, and showed differences in the forest ownership size, frequency

of visits to their own forest, and presence of successors. Ficko and Boncina [15] classified PFOs as "materialists" and "nonmaterialists". On the other hand, some studies categorized PFOs focused on their forest management behaviors. The willingness of landowners to harvest woody biomass as a characteristic of woody biomass suppliers has been noted as a factor of ownership purpose, owned forest size, tree species structure and composition, and demographics in the southern United States [16]. In contrast to these previous studies, an approach that categorizes PFOs according to their expressed future intention for their forest management and who identifies the underlying factors that can contribute to their decision-making process is required to clarify the issues involved in the NSFM, Japan.

The declining willingness of PFOs to forest management has been identified as a problem [17], with multiple factors influencing PFOs' management behaviors in Japan. Considering the PFOs' forest status, these factors included forest ownership size [18], especially planted forest size, and the distance between the residence and owned forest [19,20]. For PFOs' perceptions and management behaviors, PFOs' awareness of forests as property [21], the awareness of owned forest boundaries [22], perception of planted forest locations [19,20], and registration status [19,22] are noted. PFOs' attributes were mentioned in terms of age [23], occupation [24], and the existence of successors [24]. In addition, social relationships in local communities [25], membership in a forest owners' cooperative (FOC) [22], deteriorated functioning of FOC's regional organizations [26], and residence or absence in the village have been identified as factors influencing the owner–local community relationship [20]. Since the late 1990s, neglecting reforest postharvest has emerged as a problem resulting from PFOs' poor forest management practices [27]. Low prices of standing timber as economic factors [28] and the failure to continue the management of forest divisions upon contract expiration as institutional factors contribute to reforest abandonment [29]. Indicated by these results are the factors that define PFOs' management behaviors and their perception of forests. However, studies on future management intentions are limited. Hayashi et al. [24] mentioned regional differences in the factors that influence PFOs' willingness to sell, as well as occupation and successors. Kushiro and Ito [30] described that many PFOs, notably absentee village owners, want to disengage from forest management despite acknowledging the necessity of continuing forest management for reasons including uncertainty of inheritance, loss of boundary, and economic evaluation.

This study aimed to identify the socioeconomic factors affecting the future intention for forest management by classifying the PFOs' future intentions.

2. Methodology

2.1. Study Site

The study survey was conducted in Miyazaki Prefecture, which ranks third in Japan for timber production (1,879 thousand m^3) and first for cedar production (1739 thousand m^3) [31]. Small-scale PFOs dominate southern Miyazaki Prefecture, whereas large-scale PFOs dominate northern Miyazaki Prefecture, indicating regional variations. Southern PFOs in this prefecture have a low willingness to manage their forests [32]. In addition, the identifying PFOs and their confirming their rights is an obstacle to timber production in the southern region [33,34].

In this study, considering the difference in the forest ownership scale [35], Kunitomi Town (hereafter Kunitomi) was selected as the study site from the southern part (primarily small-scale PFOs), and Kitakata district in Nobeoka City (hereafter Kitakata) (Figure 1) from the northern part (mainly large-scale PFOs) (Figure 2).

Kunitomi is a suburban area adjacent to Miyazaki City, the capital city of Miyazaki Prefecture, with a population of 18,027 [35], an area of 130.6 km^2, and a forest area of 7736 ha (59.2% forest area) [36]. Ownership of less than 5 ha accounts for 98.8% [37]. Former Kitakata Town merged with Nobeoka City in 2006 and became a part of Nobeoka City. The population is 3321 [38], with an area of 200.1 km^2, forest areas of 17,770 ha, and a forest area ratio of 88.4% [36].

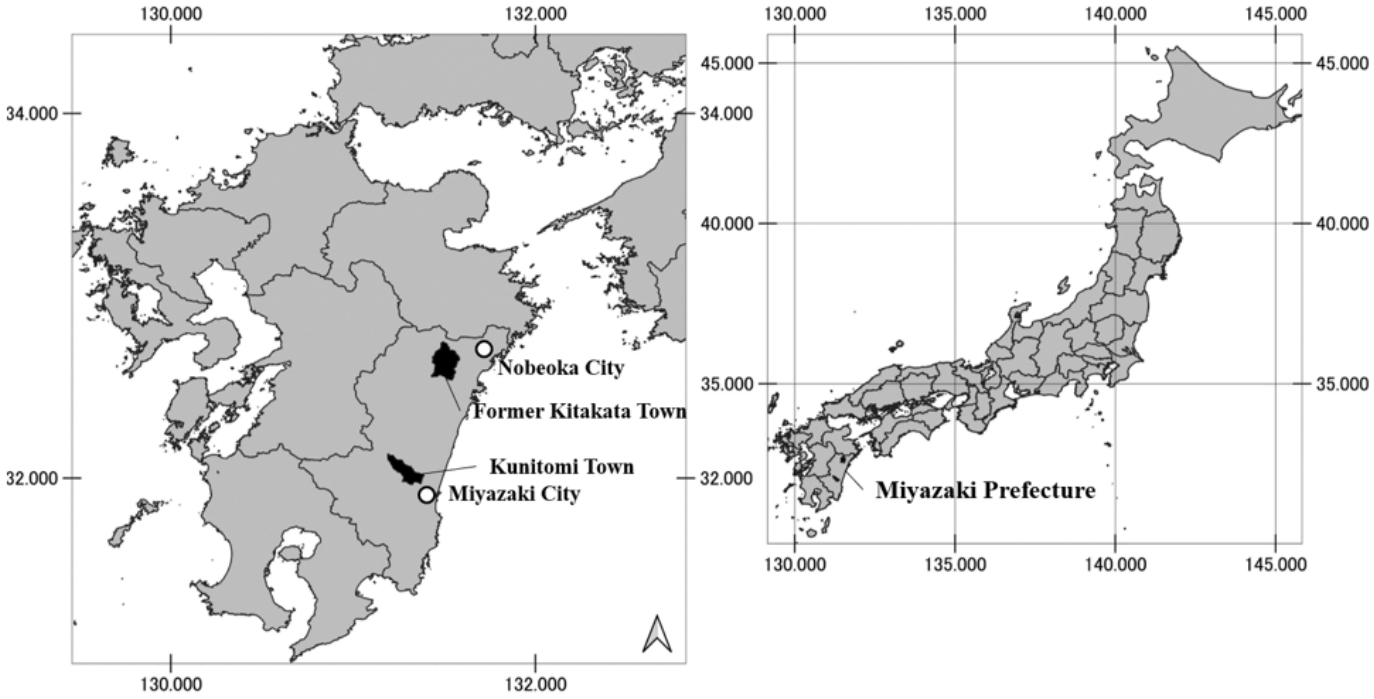

Figure 1. Study site.

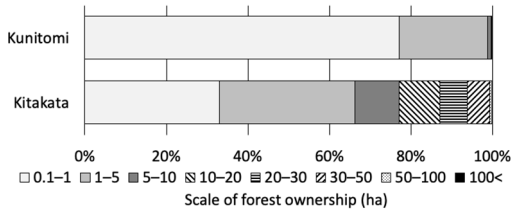

Figure 2. Proportion of forest ownership scale [34].

2.2. Method and Data Collection

All PFOs who belonged to FOC in both regions were surveyed using questionnaires to collect data. The questionnaires included questions on the following (1) forest conditions, (2) PFOs' characteristics, and (3) PFOs' management behaviors and attitudes; these factors were considered to influence the differences in the future intention of forest management. Although relatives of PFOs may have responded to the questionnaire, they were treated as PFOs in this study. In Kunitomi, 502 questionnaires were mailed out, and of the 367 questionnaires sent out, excluding 135 that were unaddressed, 166 were returned (response rate: 45.2%), and the number of valid responses was 162 (valid response rate: 44.1%). In Kitakata, out of 613 letters sent by mail (625 questionnaires were mailed and 12 were unaddressed), 299 questionnaires (response rate: 48.8%) were received, and the number of valid responses was 298 (48.6%). The questionnaire surveys were conducted from October to November 2020 in Kunitomi, and from December 2020 to January 2021 in Kitakata.

Based on the results obtained, the PFOs were classified into two groups according to their future intentions for the forest management scale: "expansion/maintenance PFOs" (hereafter EM group) who want to expand or maintain the management scale, and "decrease PFOs" (hereafter D group) who want to decrease the forest management scale. We then compared the situation in the two regions and examined the effects of regional differences in forest ownership size on PFOs' future intentions to manage their forests. Then, we compared the forest conditions factors and PFOs' characteristics. After that, we compare PFOs' behaviors and attitudes to forest management in each region, elucidating the factors

that influence future intentions to forest management and regional differences. The chi-square test was used to make comparisons at a 0.05 significance level. Based on this analysis, we discuss the chances and challenges of NSFM (Figure 3).

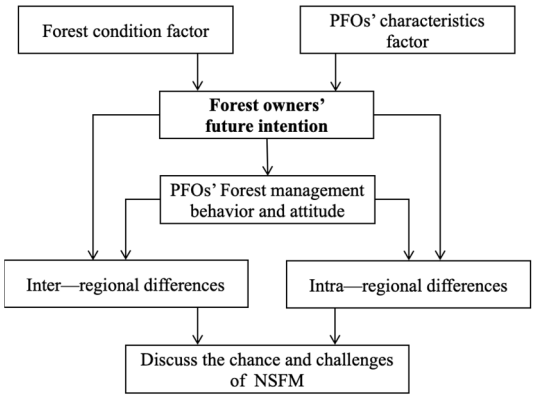

Figure 3. Research structure.

3. Results

3.1. Regional Comparisons

3.1.1. PFOs' Future Intentions

Differences were observed between the two regions' PFOs' intentions regarding the future forest management scale (p = 0.000). In Kunitomi, 47.3% (70 PFOs) belonged to the EM group, whereas 52.7% (78 HHs) belonged to the D group. In Kitakata, 70.9% (185 PFOs) belonged to the EM group, whereas 29.1% (76 PFOs) belonged to the D group.

Differences between the two regions were also seen in forest management intentions (p = 0.000). In Kunitomi, most PFOs (29.7%, 46 PFOs) wanted to "sell and transfer" their land, whereas 25.8% (40 PFOs) were "undecided," meaning that they were not thinking about or were considering the future management method. However, in Kitakata, "undecided" was the most common response (30.8%, 88 PFOs), followed by "entrustment" (28.7%, 82 PFOs). PFOs who answered "sell or transfer" accounted for 13.6% (39 PFOs). Overall, these results indicate that PFOs' future management intentions were low in Kunitomi and that many PFOs were willing to relinquish their land (Tables 1 and A1).

Table 1. Comparison of future intention to manage forests between two regions.

		Kunitomi		Kitakata		*p*-Value
		n	%	n	%	
Futureintentionof management scale *						0.000
	Increase and maintain	70	47.3	185	70.9	
	Decrease	78	52.7	76	29.1	
	Total	148	100.0	261	100.0	
Future intention of forest management *						0.000
	Independent	27	17.4	70	24.5	
	Entrustment	32	20.6	82	28.7	
	Sell or transfer	46	29.7	39	13.6	
	Suspense	40	25.8	88	30.8	
	Others	10	6.5	7	2.4	
	Total	155	100.0	286	100.0	

Note: * p-Value < 0.05.

3.1.2. Forest Ownership Size and Forest Conditions

Forest ownership size between the two regions differed, and Kunitomi tended to have smaller forest ownership size than Kitakata (p = 0.000). The most prevalent response in both regions was that PFOs were unaware of their forest sizes, with 29.2% (45 PFOs) in Kunitomi and 38.7% (106 PFOs) in Kitakata. Concerning the trends by size of PFOs who were aware of their forest areas, Kunitomi had the highest percentage of PFOs with a forest ownership size of 1–3 ha (34.4%, 53 PFOs), followed by PFOs with a forest ownership size of less than 1 ha. In Kitakata, the highest percentage of PFOs owned 10–30 ha (16.1%, 44 PFOs), followed by those who owned 5–10 ha (11.7%, 32 PFOs). Similarly, the planted forest size was unknown, with the highest percentage of PFOs in Kunitomi (40.1%, 59 PFOs) and Kitakata (41.4%, 110 PFOs). Kunitomi tended to have smaller PFOs than Kitakata (p = 0.000) based on the planted forest size known.

Regarding the degree of maturity of planted forests, 46.7% (70 PFOs) of the PFOs in Kunitomi and 60.0% (168 PFOs) in Kitakata indicated that their planted forests were "mature," whereas 0.7% (1 PFOs) in Kunitomi and 2.5% (7 PFOs) in Kitakata said they were "partially" at the harvest stage. The northern region tended to have a greater proportion of mature forests (p = 0.014). In addition, 20.7% (31 PFOs) of the respondents in Kunitomi and 12.9% (36 PFOs) in Kunitomi answered that they were unsure. No significant difference was observed between the two regions in the status of the cadastral survey, with 60.9% (95 PFOs) completed in Kunitomi and 58.5% (172 PFOs) in Kunitomi (p = 0.161).

Regarding forest registration methods, Kunitomi tended to favor single-title registration, whereas Kitakata favored shared-title registration (p = 0.002).

These results indicate that Kunitomi has smaller forest and planted forest areas than Kitakata and that Kunitomi's forest ownership size is smaller than that of Kitakata. In both regions, most PFOs were unaware of their own forest areas and planted forests (Table 2).

Table 2. Comparison of forest conditions between the two regions.

	Kunitomi		Kitakata		*p*-Value
	n	%	n	%	
Forest ownership size *					0.000
<1 ha	29	18.8	14	5.1	
1–3 ha	53	34.4	26	9.5	
3–5 ha	8	5.2	18	6.6	
5–10 ha	9	5.8	32	11.7	
10–30 ha	6	3.9	44	16.1	
30–50 ha	1	0.6	21	7.7	
50 ha<	3	1.9	13	4.7	
Unknown	45	29.2	106	38.7	
Total	154	100.0	274	100.0	
Plantation forest size *					0.000
0 ha	5	3.4	6	2.3	
<1 ha	29	19.7	20	7.5	
1–3 ha	39	26.5	40	15.0	
3–5 ha	6	4.1	18	6.8	
5–10 ha	6	4.1	25	9.4	
10–30 ha	1	0.7	41	15.4	
30–50 ha	0	0.0	4	1.5	
50 ha<	2	1.4	2	0.8	
Unknown	59	40.1	110	41.4	
Total	147	100.0	266	100.0	

	Kunitomi		Kitakata		*p*-Value
	n	%	n	%	
Condition of plantation forest *					0.014
Maturity	70	46.7	168	60.0	
Immature	48	32.0	69	24.6	
Both	1	0.7	7	2.5	
Unknown	31	20.7	36	12.9	
Total	159	100.0	283	100.0	
Condition of cadastral survey					0.161
Completion	95	60.9	172	58.5	
Partially	19	12.2	28	9.5	
Not-yet	27	17.3	75	25.5	
Unknown	15	9.6	19	6.5	
Total	156	100.0	294	100.0	
Registration type *					0.002
Sole	145	91.2	240	84.8	
Joint	10	6.3	10	3.5	
Both	4	2.5	33	11.7	
Total	159	100.0	283	100.0	

Note: * p-Value < 0.05.

3.1.3. Demographic Characteristics of PFOs

The largest proportion of PFOs in both regions were in their 60s (Kunitomi: 31.0%; Kitakata: 37.9%), followed by those in their 70s (Kunitomi: 29.0%; Kitakata: 29.1%) (p = 0.371). Gender was predominantly male (Kunitomi: 86.5%; Northern: 87.8%) (p = 0.764). The relationship between the PFO and FOC was as follows: in Kunitomi, 50.7% (74 PFOs) were cooperative members, 15.1% (22 PFOs) were heirs of cooperative members, and 34.2% (50 PFOs) were unknown. In Kitakata, 83.4% (226 PFOs) were cooperative members, 3.7%

(10 PFOs) were heirs of cooperative members, and 12.9% (35 PFOs) were unknown, indicating that more PFOs in Kitakata were cooperative members than in Kunitomi, whereas more PFOs in Kunitomi were unaware of their relationship with FOC than Kitakata ($p = 0.000$). No differences existed in the two regions regarding the PFOs' primary source of income. 59.1% (94 PFOs) of PFOs in Kunitomi and 63.5% (183 PFOs) in Kitakata reported having a successor ($p = 0.362$).

3.1.4. Awareness of Forest Ownership and Forest Management Behaviors

The proportion of respondents who were registered PFOs was 78.2% (122 PFOs) in Kunitomi and 72.1% (202 PFOs) in Kitakata, with no significant difference between the two regions ($p = 0.097$). The forest was primarily managed by its PFOs in both regions (Kunitomi: 55.0%, Kitakata: 64.0%). In comparison, 40.0% (64 PFOs) of the PFOs in Kunitomi and 28.1% (82 PFOs) in Kitakata indicated that they did not manage the forest ($p = 0.190$). The proportion of PFOs recognizing their forest locations was 75.6% (121 PFOs) in Kunitomi and 73.1% (209 PFOs) in Kitakata, whereas the proportion of PFOs not recognizing the location was 10.6% (17 PFOs) in Kunitomi and 10.8% (31 PFOs) in Kitakata, showing a similar trend ($p = 0.573$). Furthermore, in Kunitomi, 60.9% (98 PFOs) were aware of the PFO's boundaries, whereas 21.1% (34 PFOs) were unaware, and in Kitakata, 67.8% (192 PFOs) were aware, whereas 15.2% (43 PFOs) were unaware. No differences were observed between the two regions ($p = 0.149$). The PFOs' frequency of visits to the forests did not differ between the two regions ($p = 0.650$). The most common response in Kunitomi was "rarely" (23.8%, 38 PFOs), followed by "once a year" (21.9%, 35 PFOs); 3.8% (6 PFOs) of PFOs visited monthly, 18.1% (29 PFOs) visited several times a year; and 9.4% (15 PFOs) of the PFOs never visited. The most common response in Kitakata was "once every few years" (25.7%; 76 PFOs), followed by "almost never" (22.0%; 65 PFOs); 3.0% of PFOs visited monthly (9 PFOs), 19.6% (58 PFOs) visited several times a year; and 6.4% (19 PFOs) of the PFOs never visited (Table A1).

Notably, 73 PFOs (46.8%) in Kunitomi and 125 PFOs (44.8%) in Kitakata ($p = 0.690$) had harvesting experience within the previous five years. Of these, 72 PFOs (excluding 1 PFO in Kunitomi due to no response) and 125 PFOs in Kitakata were compared. The "suitable age of harvesting" was answered by 26.4% (19 PFOs) of the respondents in Kunitomi and 45.6% (57 PFOs) in Kitakata ($p = 0.010$); 6.9% (5 PFOs) of the respondents in Kunitomi and 16.8% (21 PFOs) in Kitakata responded "to earn extra income" ($p = 0.052$). "Recommended from FOC" was selected by 1.4% (1 PFO) in Kunitomi and 6.4% (8 PFOs) in Kitakata ($p = 0.159$). "Recommended from the private logging company" was 51.4% (37 PFOs) in Kunitomi and 25.6% (32 PFOs) in Kitakata ($p = 0.000$). An "increase in timber prices" was unobserved in Kunitomi but was 0.8% (1 PFO) in Kitakata ($p = 1.000$). The "expiration of sharing contract" was unobserved in Kunitomi but was 6.4% (8 PFOs) in Kitakata ($p = 0.028$). "Wind damage, disease, and insect damage" accounted for 11.1% (8 PFOs) in Kunitomi and 3.2% (4 PFOs) in Kitakata ($p = 0.033$). "Others" accounted for 9.7% (7 PFOs) in Kunitomi and 10.4% (13 PFOs) in Kitakata ($p = 1.000$).

We then determined whether these PFOs had reforested postharvest. The results showed that 29.6% (21 PFOs) of the PFOs in Kunitomi and 55.2% (64 PFOs) in Kitakata had reforested, whereas 57.7% (41 PFOs) in Kunitomi and 37.1% (43 PFOs) in Kitakata had not reforested, indicating that more PFOs in Kitakata had reforested ($p = 0.026$). Regarding the intention to conduct harvest and reforest in the future, 20.6% (32 PFOs) of the PFOs in Kunitomi and 31.3% (89 PFOs) in Kitakata wanted to conduct both harvesting and reforestation. In comparison, 10.3% (16 PFOs) in Kunitomi and 8.5% (24 PFOs) in Kitakata wanted only to harvest and not reforest (24 PFOs) in Kitakata. The PFOs who answered that they had no plans to do so were the most numerous in both areas, with 66.5% (103 PFOs) in Kunitomi and 57.7% (164 PFOs) in Kitakata.

When comparing the factors that would be important in the decision-making process for harvesting, the most common factors that differed between the two regions were "reasonable profit" (Kunitomi: 40.4%; Kitakata: 54.6%, $p = 0.007$) and "sell with the land"

(Kunitomi: 66.7%; Kitakata: 12.6%, $p = 0.000$). No differences were indicated for "trust of buyer" ($p = 0.098$), "reforestation postharvest" ($p = 0.211$), "only harvesting" ($p = 1.000$), and "the adjacent landowner also harvesting" ($p = 0.800$) (Table 3).

Table 3. Comparison of reasons for harvesting/reforestation and harvesting decisions between the two regions.

		Kunitomi		Kitakata		*p*-Value
		n	%	n	%	
Logging experience in the past 5 years						0.690
Yes		73	46.8	125	44.8	
No		83	53.2	154	55.2	
Total		156	100.0	279	100.0	
Reason for harvesting (multiple answer)						
	Suitable age of harvesting *	19	26.4	57	45.6	0.010
	To earn extra income	5	6.9	21	16.8	0.052
	Recommended by FOC	1	1.4	8	6.4	0.159
	Recommended by private logging company *	37	51.4	32	25.6	0.000
	Increase in timber prices	0	0.0	1	0.8	1.000
	Expiration of sharing contract *	0	0.0	8	6.4	0.028
	Wind damage, disease, and insect damage *	8	11.1	4	3.2	0.033
	Others	7	9.7	13	10.4	1.000
	Total	72	100.0	125	100.0	
Reforestation postharvest *						0.026
	Totally	21	29.6	64	55.2	
	Partially	7	9.9	8	6.9	
	Not planted	41	57.7	43	37.1	
	Others	2	2.8	1	0.9	
	Total	71	100.0	116	100.0	
Intention to harvesting and reforestation						0.122
Harvesting and reforestation		32	20.6	89	31.3	
Only harvesting		16	10.3	24	8.5	
Undecided		103	66.5	164	57.7	
No place to harvesting		4	2.6	7	2.5	
Total		155	100.0	284	100.0	
Factors to consider in the decision to harvesting (multiple answer)						
Reasonable benefits *		57	40.4	147	54.6	0.007
Sell with the land *		47	33.3	34	12.6	0.000
Trust of buyer		54	38.3	81	30.1	0.098
Reforestation postharvest		36	25.5	86	32.0	0.211
Not reforestation postharvest		9	6.4	18	6.7	1.000
The adjacent landowner also harvesting		7	5.0	11	4.1	0.800
Others		8	5.7	17	6.3	1.000
Total		161	100.0	283	100.0	

Note: * p-Value < 0.05.

3.2. In the Case of Kunitomi

3.2.1. Size of Ownership and Forest Conditions in Kunitomi

The EM group owned most (34.8%) of the forest management size (1–3 ha), whereas the D group had most (36.8%) of the PFOs who did not know the size, but no difference was indicated in the trend of the forest size ($p = 0.112$). Similarly, the size of plantations did not differ ($p = 0.094$), but the EM group had the largest number of PFOs with 1–3 ha (34.8%), whereas the D group had the largest number of PFOs who did not know the size of their plantations (48.8%). The maturity of planted forests was most frequently answered by PFOs of both the EM group (47.0%) and the D group (60.0%) as mature, whereas the D group had the largest proportion of PFOs who did not know the status ($p = 0.518$). Land cadastral surveys ($p = 0.316$) and land registration titles were most often under a single title, with no differences indicated ($p = 0.159$) (Table 4).

Table 4. Comparison of forest conditions between the two groups in Kunitomi.

	EM Group		D Group		Total		*p*-Value
	n	%	n	%	n	%	
Forest owned area							0.112
<1 ha	12	17.6	16	21.1	28	19.4	
1–3 ha	30	44.1	20	26.3	50	34.7	
3–5 ha	4	5.9	4	5.3	8	5.6	
5–10 ha	4	5.9	5	6.6	9	6.3	
10–30 ha	3	4.4	3	3.9	6	4.2	
30–50 ha	1	1.5	0	0.0	1	0.7	
50 ha<	2	2.9	0	0.0	2	1.4	
Unknown	12	17.6	28	36.8	40	27.8	
Total	68	100.0	76	100.0	144	100.0	
Plantation forest area							0.094
0 ha	1	1.5	4	5.4	5	3.6	
<1 ha	15	22.7	14	18.9	29	20.7	
1–3 ha	23	34.8	14	18.9	37	26.4	
3–5 ha	4	6.1	2	2.7	6	4.3	
5–10 ha	2	3.0	4	5.4	6	4.3	
10–30 ha	1	1.5	0	0.0	1	0.7	
30–50 ha	0	0.0	0	0.0	0	0.0	
50 ha<	1	1.5	0	0.0	1	0.7	
Unknown	19	28.8	36	48.8	55	39.3	
Total	66	100.0	74	100.0	140	100.0	
Age of plantation forest							0.518
Maturity	31	47.0	35	60.0	66	47.5	
Immature	23	34.8	21	24.6	44	31.7	
Both	1	1.5	0	2.5	1	0.7	
Unknown	11	16.7	17	12.9	28	20.1	
Total	66	100.0	73	100.0	139	100.0	
Status of land cadastral survey							0.316
Completion	43	63.2	41	55.4	84	59.2	
Partially	11	16.2	8	10.8	19	13.4	
Not-yet	8	11.8	16	21.6	24	16.9	
Unknown	6	8.8	9	12.2	15	10.6	
Total	68	100.0	74	100.0	142	100.0	
Registration type							0.159
Sole	68	97.1	69	89.6	137	93.2	
Joint	2	2.9	6	7.8	8	5.4	
Both	0	0.0	2	2.6	2	1.4	
Total	70	100.0	77	100.0	147	100	

3.2.2. Demographic Characteristics of PFOs

The age distribution of PFOs (p = 0.108), gender (p = 0.430), relationship with the FOC (p = 0.960), and PFOs' primary income source showed no differences between the two groups. Significant differences were observed in the presence or absence of successors, with the D group tending to have no successors (p = 0.019) (Table 5).

Table 5. Comparison of PFOs' characteristics between the two groups in Kunitomi.

	EM Group		D Group		Total		*p*-Value
	n	%	n	%	n	%	
Relationship with FOC							0.960
Member	38	60.3	31	42.5	69	50.7	
Member successor	9	14.3	12	16.4	21	15.4	
Unknown	16	25.4	30	41.1	46	33.8	
Total	63	100.0	73	100.0	136	100.0	
Successors in forest management *							0.019
Existence	49	70.0	39	50.6	88	59.9	
Absence	21	30.0	38	49.4	59	40.1	
Total	70	100.0	77	100.0	147	100.0	
Main income (multiple answer)							
Agriculture	27	38.6	20	27.0	47	32.6	0.158
Forestry	3	4.3	0	0.0	3	2.1	0.112
Independent business	4	5.7	0	0.0	4	2.8	0.053
Salary and wages	16	22.9	18	24.3	34	23.6	0.847
Pension	30	42.9	42	56.8	72	50.0	0.133
Real estate	3	4.3	0	0.0	3	2.1	0.112
Other	0	0.0	2	2.7	2	1.4	0.497
Total	70	100.0	74	100.0	144	100.0	

Note: * *p*-Value < 0.05.

3.2.3. PFOs' Forest Management Behaviors and Attitudes

In both regions, the registered person was typically the principal owner ($p = 0.521$). Most primary managers were owners themselves (74.3%) in the EM group, whereas the majority were not managing (50.6%) in the D group ($p = 0.002$). A difference existed in the number of respondents who knew the location of their forest, with the EM group tending to have a higher percentage of respondents who knew the location of their forest ($p = 0.010$). The same was true for the boundaries, with the EM group tending to have more PFOs who knew the boundaries in person ($p = 0.020$). Comparing the frequency of forest visits revealed that the EM group tended to visit the forest more frequently ($p = 0.002$) (Table 6).

Table 6. Comparison of forest management behaviors between the two groups in Kunitomi.

	EM Group		D Group		Total		*p*-Value
	n	%	n	%	n	%	
Registration name							0.521
Owner	57	82.6	57	74.0	114	78.1	
Previous generation	11	15.9	18	23.4	29	19.9	
Varies depending on site	1	1.4	1	1.3	2	1.4	
Unknown	0	0.0	1	1.3	1	0.7	
Total	69	100.0	77	100.0	146	100.0	
Managing person *							0.002
Owner	52	74.3	32	41.6	84	57.1	
Relatives	0	0.0	3	3.9	3	2.0	
FOC	1	1.4	2	2.6	3	2.0	
Private company	0	0.0	0	0.0	0	0.0	
Not managing	16	22.9	39	50.6	55	37.4	
Varies depending on site	0	0.0	0	0.0	0	0.0	
Others	1	1.4	1	1.3	2	1.4	
Total	70	100.0	77	100.0	292	100.0	
Person or organization recognizes location *							0.010
Owner	61	88.4	50	64.1	111	75.5	
Relatives	0	0.0	3	3.8	3	2.0	
FOC	0	0.0	2	2.6	2	1.4	
Municipality	1	1.4	8	10.3	9	6.1	
Not recognized	4	5.8	12	15.4	16	10.9	
Others	3	4.3	3	3.8	6	4.1	
Total	69	100.0	78	100.0	147	100.0	

Table 6. *Cont.*

	EM Group		D Group		Total		*p*-Value
	n	%	n	%	n	%	
Person or organization recognizes boundary *							0.020
Owner	52	74.3	38	49.4	90	61.2	
Relatives	1	1.4	4	5.2	5	3.4	
FOC	0	0.0	2	2.6	2	1.4	
Municipality	3	4.3	12	15.6	15	10.2	
Not recognized	11	15.7	19	24.7	30	20.4	
Others	3	4.3	2	2.6	5	3.4	
Total	70	100.0	77	100.0	147	100.0	
Frequency of owned forest visits by owner *							0.002
Every month	5	7.1	1	1.3	6	4.1	
Several times a year	21	30.0	7	9.1	28	19.0	
Once a year	17	24.3	16	20.8	33	22.4	
Once every few years	10	14.3	19	24.7	29	19.7	
Almost never	9	12.9	24	31.2	33	22.4	
Never	4	5.7	8	10.4	12	8.2	
Varies depending on site	4	5.7	2	2.6	6	4.1	
Total	70	100.0	77	100.0	147	100.0	

Note: * *p*-Value < 0.05.

No differences between regions were indicated in the percentage of PFOs who harvested in the last five years ($p = 0.742$), and the reasons that led to harvesting were similar. Regarding reforestation postharvest, 46.4% of the PFOs in the EM group reforested, whereas 17.1% in the D group did, indicating that PFOs with low motivation for forest management tended not to reforest ($p = 0.037$). The EM group was likelier to prioritize the following factors in their decision to log: the prospect of substantial profit ($p = 0.015$) and reforestation postharvest ($p = 0.030$). However, the D group demonstrated a greater likelihood of selling stumpage with the land ($p = 0.000$) (Table 7).

Table 7. Comparison of reasons for harvesting/reforestation and harvesting decisions between the two groups in Kunitomi.

	EM Groups		D Group		Total		*p*-Value
	n	%	n	%	n	%	
Harvesting experience in the past 5 years							0.742
Yes	31	45.6	38	48.7	69	47.3	
No	37	54.4	40	51.3	77	52.7	
Total	68	100.0	78	100.0	146	100.0	
Reason for logging (multiple answer)							
Suitable age of logging	10	34.5	7	20.0	17	26.6	0.258
To earn extra income	2	6.9	2	5.7	4	6.3	1.000
Recommended by FOC	1	3.4	0	0.0	1	1.6	0.453
Recommended by private company	13	44.8	22	62.9	35	54.7	0.208
Wind damage, disease, and insect damage	4	13.8	3	8.6	7	10.9	0.692
Others	2	6.9	4	11.4	6	9.4	0.681
Total	29	100.0	35	100.0	64	100.0	
Reforest postharvest *							0.037
Totally	13	46.4	7	17.1	19	30.2	
Partially	4	14.3	4	8.6	7	11.1	
Not planted	10	35.7	27	71.4	35	55.6	
Others	1	3.6	0	2.9	2	3.2	
Total	28	100.0	38	100.0	63	100.0	
Intention to harvesting and reforestation *							0.000
Harvesting and reforestation	29	42.0	3	3.9	32	2.1	
Only harvesting	3	4.3	13	17.1	16	11.0	
Undecided	35	50.7	59	77.6	94	64.8	
No place to harvesting	2	2.9	1	1.3	3	2.1	
Total	69	100.0	76	100.0	145	100.0	

Table 7. *Cont.*

	EM Groups		D Group		Total		*p*-Value
	n	%	n	%	n	%	
Factors to consider in the decision to harvesting (multiple answer)							
Reasonable benefits*	33	52.4	23	31.5	56	41.2	0.015
Sell with land *	4	6.3	40	54.8	44	32.4	0.000
Trust of buyer	28	44.4	24	32.9	52	38.2	0.216
Reforest postharvest *	22	34.9	13	17.8	35	25.7	0.030
Not reforest postharvest	4	6.3	5	6.8	9	6.6	1.000
Neighboring owner also logs	2	3.2	5	6.8	7	5.1	0.450
Others	5	7.9	2	2.7	7	5.1	0.249
Total	63	100.0	73	100.0	136	100.0	

Note: * *p*-Value < 0.05.

3.3. In the Case of Kitakata

3.3.1. Future Intentions of PFOs

Most PFOs in the EM and D groups reported that they were unsure of their forest size (EM group: 32.4%; D group: 48.5%). Most respondents in the EM group (18.8%) owned 10–30 ha, whereas most respondents in the D group (13.2%) owned 1–3 ha, indicating that the EM group tended to own a larger forest. In contrast, a higher percentage of respondents in the D group did not know their owned forest size ($p = 0.007$). Similarly, the plantation forest size of the EM group was the most common (32.0% in the EM group; 57.6% in the reduced size group). As with the forest size, the EM group tended to have a larger planted forest size and to know the size ($p = 0.000$). The maturity of planted forests was most frequently reported as mature by both the EM (63.8%) and D groups (57.5%), although a higher percentage of PFOs in the D group did not know the condition ($p = 0.006$). No differences were observed in the implementation of cadastral surveys ($p = 0.199$) or the method of land registration title ($p = 0.570$) (Table 8).

Table 8. Comparison of forest conditions between the two groups in Kitakata.

	EM Group		D Group		Total		*p*-Value
	n	%	n	%	n	%	
Forest size *							0.007
<1 ha	6	3.4	7	10.3	13	5.3	
1–3 ha	16	9.1	9	13.2	25	10.2	
3–5 ha	10	5.7	5	7.4	15	6.1	
5–10 ha	27	15.3	3	4.4	30	12.3	
10–30 ha	33	18.8	7	10.3	40	16.4	
30–50 ha	15	8.5	3	4.4	18	7.4	
50 ha<	12	6.8	1	1.5	13	5.3	
Unknown	57	32.4	33	48.5	90	36.9	
Total	176	100.0	68	100.0	244	100.0	
Plantation forest size *							0.000
0 ha	3	1.7	2	3.0	5	2.1	
<1 ha	9	5.2	10	15.2	19	8.0	
1–3 ha	29	16.9	8	12.1	37	15.5	
3–5 ha	15	8.7	2	3.0	17	7.1	
5–10 ha	20	11.6	3	4.5	23	9.7	
10–30 ha	35	20.3	3	4.5	38	16.0	
30–50 ha	4	2.3	0	0.0	4	1.7	
50 ha<	2	1.2	0	0.0	2	0.8	
Unknown	55	32.0	38	57.6	93	39.1	
Total	172	100.0	66	100.0	238	100.0	

Table 8. *Cont.*

	EM Group		D Group		Total		*p*-Value
	n	%	n	%	n	%	
Age of plantation forest *							0.006
Maturity	113	63.8	42	57.5	155	62.0	
Immature	45	25.4	16	21.9	61	24.4	
Both	7	4.0	0	0.0	7	2.8	
Unknown	12	6.8	15	20.5	27	10.8	
Total	177	100.0	73	100.0	250	100.0	
Status of cadastral survey							0.199
Completion	104	56.5	49	65.3	153	59.1	
Partially	18	9.8	6	8.0	24	9.3	
Not-yet	52	28.3	13	17.3	65	25.1	
Unknown	10	5.4	7	9.3	17	6.6	
Total	184	100.0	75	100.0	259	100.0	
Registration type							0.570
Sole	153	85.0	65	87.8	218	85.8	
Joint	7	3.9	1	1.4	8	3.1	
Both	20	11.1	8	10.8	28	11	
Total	180	100.0	74	100.0	254	100	

Note: * *p*-Value < 0.05.

3.3.2. Demographic Characteristics of PFOs

No differences were found between the two groups in the PFOs' age distribution ($p = 0.863$) or gender ($p = 0.156$). As for the relationship with FOC, the D group was likelier to be unaware of whether they were members ($p = 0.004$). Regarding succession, the D group was likelier to have no successor ($p = 0.000$). In addition, a higher proportion of the EM group was in agriculture ($p = 0.042$) and forestry ($p = 0.028$) as the primary income sources for the PFOs (Table 9).

Table 9. Comparison of PFOs' characteristics between the two groups in Kitakata.

	EM Group		D Group		Total		*p*-Value
	n	%	n	%	n	%	
Relationship with FOC *							0.004
Member	151	87.8	52	74.3	203	83.9	
Member successor	6	3.5	1	1.4	7	2.9	
Unknown	15	8.7	17	24.3	32	13.2	
Total	172	100.0	70	100.0	242	100.0	
Successors in forest management *							0.000
Existence	134	74.0	31	41.9	165	64.7	
Absence	47	26.0	43	58.1	90	35.3	
Total	181	100.0	74	100.0	255	100.0	
Primary income source							
Agriculture *	55	30.6	13	17.6	68	26.8	0.042
Forestry *	16	8.9	1	1.4	17	6.7	0.028
Independent business	14	7.8	8	10.8	22	8.7	0.465
Salary and wages	46	25.6	24	32.4	70	27.6	0.282
Pension	81	45.0	36	48.6	117	46.1	0.678
Real estate	2	1.1	0	0.0	2	0.8	1.000
Others	3	1.7	1	1.4	4	1.6	1.000
Total	180	100.0	74	100.0	254	100.0	

Note: * *p*-Value < 0.05.

3.3.3. PFOs' Forest Management Behaviors and Attitudes

Both groups had the highest percentage of respondents, in which the principal was the registered owner ($p = 0.981$). The principal administrator was the owner himself in both the EM (78.6%) and D groups (64.9%). In both groups, the owner recognized the location ($p = 0.355$) and boundaries ($p = 0.051$) of the owned forest; the highest percentage of owners themselves managed the forest, whereas a higher percentage of the D group did

not (p = 0.000). Comparing the frequency of visits to the forest revealed that the EM group tended to visit more frequently (p = 0.000) (Table 10). No difference was observed between the two groups in the percentage of PFOs harvested in the past five years (p = 0.679). Likewise, no difference was observed in the reasons for harvesting among PFOs who had logged before. Regarding reforest postharvest, 63.4% of the PFOs in the EM group fully reforested, whereas 51.6% of those in the D group did not, indicating that PFOs with low motivation for forest management tended not to reforest (p = 0.029).

Table 10. Comparison of forest management behaviors between the two groups in Kitakata.

	EM Group		D Group		Total		*p*-Value
	n	%	n	%	n	%	
Registration name							0.981
Owner	129	74.1	56	75.7	185	74.6	
Previous generation	34	19.5	14	18.9	48	19.4	
Varies depending on site	9	5.2	3	4.1	12	4.8	
Unknown	2	1.1	1	1.4	3	1.2	
Total	174	100.0	74	100.0	248	100.0	
Person or organization aware of location							0.355
Owner	143	78.6	48	64.9	191	74.6	
Relatives	5	2.7	4	5.4	9	3.5	
FOC	7	3.8	4	5.4	11	4.3	
Municipality	8	4.4	6	8.1	14	5.5	
Not recognized	15	8.2	9	12.2	24	9.4	
Others	4	2.2	3	4.1	7	2.7	
Total	182	100.0	74	100.0	256	100.0	
Person or organization aware of boundary							0.051
Owner	134	74.4	40	54.1	174	68.5	
Relatives	7	3.9	5	6.8	12	4.7	
FOC	5	2.8	2	2.7	7	2.8	
Municipality	8	4.4	6	8.1	14	5.5	
Not recognized	20	11.1	17	23.0	37	14.6	
Others	6	3.3	4	5.4	10	3.9	
Total	180	100.0	74	100.0	254	100.0	
Managing person *							0.000
Owner	136	73.9	34	45.3	170	65.6	
Relatives	2	1.1	3	4.0	5	1.9	
FOC	4	2.2	3	4.0	7	2.7	
Private company	0	0.0	1	1.3	1	0.4	
Not managing	37	20.1	32	42.7	69	26.6	
Varies depending on site	2	1.1	1	1.3	3	1.2	
Others	3	1.6	1	1.3	4	1.5	
Total	184	100.0	75	100.0	259	100.0	
Frequency of owned forest visits by owner *							0.000
Every month	9	4.9	0	0.0	9	3.4	
Several times a year	48	25.9	7	9.2	55	21.1	
Once a year	36	19.5	8	10.5	44	16.9	
Once every few years	49	26.5	20	26.3	69	26.4	
Almost never	30	16.2	28	36.8	58	22.2	
Never	7	3.8	6	7.9	13	5.0	
Varies depending on site	6	3.2	7	9.2	13	5.0	
Total	185	100.0	76	100.0	261	100.0	

Note: * p-Value < 0.05.

Differences were also observed in the factors that were important in the decision to harvest. A high percentage of the EM group indicated that they expected to make a substantial profit (p = 0.005), whereas a high percentage of the D group indicated that they were willing to sell the land with stumpage (p = 0.000) (Table 11).

Table 11. Comparison of reasons for harvesting/reforestation and harvesting decisions between the two groups in Kitakata.

	EM Group		D Group		Total		*p*-Value
	n	%	n	%	n	%	
Harvesting experience in the past 5 years							0.679
Yes	86	49.1	34	45.3	120	48.0	
No	89	50.9	41	54.7	130	52.0	
Total	175	100.0	75	100.0	250	100.0	
Reason for harvesting (multiple answer)							
Suitable age of logging	39	45.3	15	44.1	54	45.0	1.000
To earn extra income	16	18.6	4	11.8	20	16.7	0.428
Recommended by FOC	6	7.0	2	5.9	8	6.7	0.453
Recommended by private company	20	23.3	12	35.3	32	26.7	0.251
Increase in timber prices	1	1.2	0	0.0	1	0.8	1.000
Expiration of sharing contract	5	5.8	3	8.8	8	6.7	0.686
Wind damage, disease, and insect damage	3	3.5	1	2.9	4	3.3	1.000
Others	9	10.5	3	8.8	12	10.0	1.000
Total	86	100.0	34	100.0	120	100.0	
Reforest postharvest *							0.029
Totally	52	63.4	11	35.5	63	55.8	
Partially	3	3.7	4	12.9	7	6.2	
Not planted	26	31.7	16	51.6	42	37.2	
Others	1	1.2	0	0.0	1	0.9	
Total	82	100.0	31	100.0	113	100.0	
Intention to harvesting and reforestation *							0.000
Harvesting and reforestation	73	40.8	10	13.2	83	32.5	
Only harvesting	9	5.0	12	15.8	21	8.2	
Undecided	94	52.5	52	68.4	146	57.3	
No place to harvesting	3	1.7	2	2.6	5	2.0	
Total	179	100.0	100	100.0	255	100.0	
Factors to consider in the decision to harvesting (multiple answer)							
Reasonable benefits *	106	59.9	29	40.3	135	54.2	0.005
Sell with land *	9	5.1	20	27.8	29	11.6	0.000
Trust of buyer	51	28.8	24	33.3	75	30.1	0.543
Reforest postharvest *	63	35.6	21	29.2	84	33.7	0.377
Not reforest postharvest	11	6.2	6	8.3	17	6.8	0.583
Neighboring owner also harvest	6	3.4	4	5.6	10	4.0	0.481
Others	8	4.5	6	8.3	14	5.6	0.238
Total	177	100.0	72	100.0	249	100.0	

Note: * p-Value < 0.05.

4. Discussion and Conclusion

The NSFM aims to realize efficient and sustainable timber production based on consolidating the forest land of PFOs with low future intentions. In this study, we administered a questionnaire to PFOs in Miyazaki Prefecture, one of the most active areas for timber production in Japan, to examine the socioeconomic factors that affect PFOs' future intentions.

The PFOs' willingness to manage forests varies by region [32]. First, this study compared PFOs' future intentions and the factors that might influence them across regions with different forest ownership sizes. In the small-scale region, 52.7% of PFOs desired to reduce the future management scale, whereas 70.9% of PFOs in the large-scale region desired to maintain or increase the management scale. A comparison of the two regions revealed the problems in private forest management. A common problem in small and large regions was the lack of awareness of forests owned by PFOs themselves. In particular, the fact that many PFOs were unaware of the size of their forests and planted forests indicated that PFOs do not have the sources to understand the value of their forests and consider the direction of future forest management. The importance of successors in forest management was also indicated. Additionally, this study revealed the challenges specific to the small-scale regions. The small-scale regions showed fewer future intentions to manage forests. Many PFOs were unaware of the maturity of their planted forests as well as the size of their forests. This may be attributed to the lack of understanding in many PFOs regarding the economic value of their planted forests, which may be one factor that reduces their willingness to manage their forests. Since many PFOs did not understand the value of their forests, their decision-making process regarding forest management was passive, as evidenced by the reasons for their decision to harvest their forest. Additionally, many PFOs

wanted to quit forestry, whereas many did not reforest postharvest (Table 12). These results indicated the need to develop a framework to provide PFOs with enough information to consider future management directions while implementing NSFM. At the same time, since small-scale regions are less willing to manage forests than large-scale regions, aggerating forest management right by municipalities is promising for the sustainable management of forests. However, since the workload of municipalities is excessive [11], the prefectural government should support municipalities in small-scale areas with an emphasis on small-scale regions. PFOs' low willingness to manage their forests may harm timber production, as owner identification and rights identification are particular barriers to timber production in the small-scale region [33,34]. Similar results were obtained for forest and planted forest size, as they influenced the current willingness to manage [13,16,18–20].

Table 12. Inter-regional differences of forest management problems.

Trend in Forest Management Issues in Small-Scale Regions	Forest Management Issues Common to Both Regions
• Low intention for forest management • Unaware of forest maturity • Passive decision-making for harvesting • Low reforestation rate • PFOs want to quit forestry	• Lacked basic knowledge of owned forest condition (forest size, planted forest size) • Few PFOs have future forest management plans • Low future intention of PFOs with no successor

Next, based on the survey results, we examined the factors affecting the future intentions of PFOs and the forest management behaviors of PFOs with low future intentions. The factor affecting future intention in small-scale regions was the presence of successors [24]. No difference was found in the forest size [13,16,18–20], which was considered a factor while analyzing the results, likely because the forest size was biased toward small-scale. In contrast, forest size, planted forest size, and planted forest maturity were the factors of forest condition that influenced the future intentions in large-scale regions. These results suggest that the economic value of forests affects the future intentions of the PFOs in large-scale regions. In addition, the existence of successors, the relationship with the FOC, and forestry's position as an income source were also indicated as factors. Since it is essential to clarify the forest management behaviors of the PFOs with low future intentions to consider forestry policies, we summarized the characteristics of the forest management behaviors and attitudes of the D group. Among the common issues associated with both regions, the D group tended to have scarce forest management and be willing to dispose of their forestlands. Therefore, these PFOs tended not to implement reforestation because they had less emphasis on the reforest postharvest. In small-scale regions, few PFOs had future management directions and were unaware of the location and boundaries of their forests (Table 13). The D group was not considered interested in the economic value of the forest. There could be two possible causes behind the lack of interest in economic value: first, they do not have information about the forests, and second, they must dispose of the forests due to the absence of successors to inherit them.

Under the Forest Management Law, municipalities must conduct surveys of PFOs' intentions, and some have already begun to do so. Many PFOs are likely to respond to this survey without having all the facts they need to decide on their future forest management intentions. A procedural flaw can be identified regarding the intention survey, which encourages PFOs to make decisions without information about their forests. Before the survey, the government must provide an opportunity for the PFOs to know the location and boundaries of the forest, resource status, and other information. In addition, the omission of local forest ownership size from the criteria for allocating FETT to municipalities is a flaw of this system [5]. FETT is used for "expenses related to forest improvement and its promotion, such as thinning, human resource development and securing of bearers, promotion of timber use, and public awareness." The areas requiring enhanced forest improvement

are those with low future management intentions. Furthermore, the results of this study suggest that many PFOs in small-scale regions would like to outsource management or relinquish their land. Therefore, the administrative burden of conducting the survey and forest management aggregation in municipalities with small-scale regions is considered high. For municipalities, securing finances is the most critical aspect of operating NSFM [30]. These results suggest that FETT allocation criteria could still be considered based on the regional characteristics of ownership size. Differences were also observed in the factors that influenced the decision of forest PFOs to harvest between the two regions with different ownership sizes.

Table 13. The factors affecting the PFOs' future intention, tendency of D group's forest management behaviors.

	Small-Scale Regions	Large-Scale Regions	Common Issues to Both Regions
Forest condition factors	-	• Owned forest size • Plantation forest size • Recognition of maturity of planted forest	-
PFOs' characteristics factors	• Existence of successor	• Existence of successor • Recognition of relationship with FOC • Position of forestry as income source	• Existence of successor
Trends in management behaviors and attitudes toward owned forests among Group D	• Scarce forest management • Want to dispose of land • Less interest in the economic value of owned forest • Undecided future forest management plan • Do not reforest postharvest • Less emphasis on reforests postharvest • Few frequencies of owned forest visits • Do not recognize location of owned forest • Do not recognize boundary of owned forest	• Scarce forest management • Want to dispose of land • Less interest in the economic value of owned forest • Do not reforest postharvest • Less emphasis on reforests postharvest • Few frequencies of owned forest visits	• Scarce forest management • Want to dispose of land • Less interest in the economic value of owned forest • Do not reforest postharvest • Less emphasis on reforests postharvest • Few frequencies of owned forest visits

This study examined the factors that influence the PFOs' future intentions in small and large regions by categorizing them by their future intentions and comparing the two types. Comparing the two groups revealed that the EM group prioritized economic benefits and the sustainability of the forest resource in their harvesting decisions. In contrast, the D group had more PFOs who wanted to relinquish their land and withdraw from forestry management. The EM group tended to own more forestland, suggesting that the size or economic value of their forest holdings influenced their future willingness to manage their forests. The D group was characterized by less frequent forest visits and a greater proportion of PFOs who lacked basic forest knowledge, such as area, location, and boundaries. These findings suggest that PFOs' lack of knowledge about their forests may result in uninterested in forest management.

The existence of successors is an essential factor in the continuity of forest management [24], in addition to the size, especially planted forest size [18–20]. Therefore, information on the forest owned, forest area, and the availability of successors are factors influencing willingness to future forest management. The forest management behaviors of PFOs with low future willingness to manage revealed issues regarding forest sustainability. In terms of harvesting decisions, the EM group emphasized the economic benefits and sustainability of the resource. However, the D group saw the logging decision as an opportunity to withdraw from forestry management and passively made logging decisions. This suggests that forests owned by PFOs with low future intention goals are a source of the increased abandonment of reforested.

To better reflect effective forest policy through PFOs typologies [14], examining the factors underlying the decisions of typified PFOs is necessary [12]. PFOs who wish to reduce the size of their future management have poorer forest management behaviors and are likelier to abandon the reforested area. Therefore, the method of categorizing PFOs based on their future willingness to manage the forest with resource sustainability and efficiency of operations was considered reasonable. However, promoting the transfer of forests owned by PFOs with a low future intention to forest management is insufficient; measures are also required to increase PFOs' willingness to forest management. Furthermore, PFOs must be given more opportunities to learn enough about their forests to make informed decisions about future management direction. Especially, the NSFM must consider the ways to develop forest information, provide PFOs with opportunities to obtain such information, encourage PFOs who are willing to manage their forests, and strengthen municipal work structures [11].

Therefore, the role of FOCs who have a good understanding of the status of local forests is crucial [26]. In large areas where the economic value of forests is relatively high, strengthening the relationship between PFOs and FOCs may be effective in motivating PFOs to manage the forests. It is expected that PFOs will be more likely to obtain information on their forests from FOCs, which will provide an opportunity for PFOs to recognize the economic value of their forests. In addition, since many PFOs are willing to dispose their lands in small-scale regions, the aggregation of the forest management rights by the municipalities will be required for sustainable forest management. As the workload of municipalities is expected to increase due to this policy, it will be necessary for the prefectural government to support the municipalities with small forest ownership in a focused manner [6,8].

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Appendix A

Table A1. Comparison of forest management behaviors between two regions.

	Kunitomi		Kitakata		*p*-Value
	n	%	n	%	
Registration name					0.097
Owner	122	78.2	202	72.1	
Previous generation	30	19.2	56	20.0	
Varies depend on site	2	1.3	4	1.4	
Unknown	2	1.3	18	6.4	
Total	156	100.0	280	100.0	
Managing person					0.190
Owner	88	55.0	187	64.0	
Relatives	3	1.9	6	2.1	
FOC	3	1.9	9	3.1	
Private company	0	0.0	1	0.3	
Not managing	64	40.0	82	28.1	
Varies depend on site	0	0.0	3	1.0	
Others	2	1.3	4	1.4	
Total	160	100.0	292	100.0	
Person or organization aware of location					0.573
Owner	121	75.6	209	73.1	
Relatives	3	1.9	9	3.1	
FOC	3	1.9	14	4.9	
Municipality	10	6.3	16	5.6	
Not recognized	17	10.6	31	10.8	
Others	6	0.7	7	2.4	
Total	160	100.0	286	100.0	
Person or organization aware of boundary					0.149
Owner	98	60.9	192	67.8	
Relatives	5	3.1	13	4.6	
FOC	2	1.2	9	3.2	
Municipality	16	9.9	15	5.3	
Not recognized	34	21.1	43	15.2	
Others	6	3.7	11	3.9	
Total	161	100.0	283	100.0	
Frequency of owned forest visits by owner					0.650
Every month	6	3.8	9	3.0	
Several times a year	29	18.1	58	19.6	
Once a year	35	21.9	55	18.6	
Once every few years	31	19.4	76	25.7	
Almost never	38	23.8	65	22.0	
Never	15	9.4	19	6.4	
Varies depends on site	6	3.8	14	4.7	
Total	160	100.0	296	100.0	

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