Forest Owner Attitudes about Tree Thinning Practices – A Case Study in Hayakawa, Yamanashi Prefecture, Japan –

Nakajima, T., Kanomata, H., Ito, T., Tatsuhara, S. & Shiraishi, N.

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Abstract: For expansion of forest area by implementing thinning, it is important to analyze attitudes of forest owners, who are the ultimate decision makers for implementation of silvicultural practices in private forests. Using a questionnaire survey, we aimed to clarify the preferences of forest owners for the implementation of thinning practices. We surveyed the attitudes of forest owners regarding silvicultural practices and strategies to expand plantation forest area through commercial thinning. We conducted a questionnaire survey in Hayakawa, Japan, which has a large forest area, to examine forest owner attitudes about implementing pre-commercial thinning, commercial thinning from below, line thinning, or joint thinning together with other land owners. We also asked forest owners what criteria are important in making decisions for joint implementation of thinning. The interest of forest owners in line thinning was relatively low. Given a harvesting income to expenditure ratio that is not negative, more than half of surveyed forest owners, except for those with no intention to thin, intended to implement thinning. The most important factor for forest owners on whether to agree to joint implementation of thinning was the possibility of reducing harvesting costs by scaling up. If we could provide evidence that harvesting income and expenditure would not be negative when cooperating with other forest owners in joint implementation of thinning, it may be possible to expand managed plantation forest area under thinning

with the forest owners' consent.

1. Introduction

The decline in prices of timber produced from plantation forests in Japan has led to the increase of forests being left unmanaged. A previous study analyzing forest inventory data and a sampling ground survey throughout Japan suggested that more than half of the area in plantation forests in Japan has not been thinned for 10 years (Nakajima *et al.*, 2005, 2006a, b, 2007; Hiroshima and Nakajima, 2006; Matsumoto *et al.*, 2007). An increase in unthinned mature plantation forests containing sugi (*Cryptomeria japonica*) and hinoki (*Chamaecyparis obtusa*) stands is evident (Forestry Agency, 2005). Approximately half of all Japanese plantation forests are more than 40 years old and require thinning in order to accelerate the growth (Forestry Agency, 2005). Not only intensive thinning can improve environmental functions but also timber production (Kimball and Hunter, 1990; Hansen *et al.*, 1991; Silbaugh and Betters, 1995; Kimmins, 1997; Moore and Allen, 1999). It is therefore important to advance proposals for silvicultural practices and to expand managed forestland. Under the framework of the Kyoto Protocol for annex 1 countries, the carbon sink in forests is calculated both in terms of forests that have been afforested, reforested, and deforested (ARD forests; Lee *et al.*, 2005) since 1990, as described in Article 3.3, and in terms of forests that have received silvicultural treatment since 1990 (FM forests) under Article 3.4 (UNFCCC, 2002; IPCC, 2003). In the Marrakech Accords, the carbon sink in FM forests is capped at 13.0 Mt-C/yr, a level that corresponds to 3.9% to 6.0% of the Quantified Emission Limitation and Reduction Objectives (QELROs) of Japan (Oberthür and Ott, 2001; Hashimoto and Takamura, 2002; UNFCCC, 2002), because it is important to expand forest area by implementing thinning in the context of global warming (Nakajima *et al.*, 2007).

Approximately 80% of plantation forests in Japan are privately owned (Forestry Agency, 2005); therefore, it is necessary to encourage these owners, who are the ultimate decision makers for implementation of silvicultural practices in private forests, to implement thinning. Using a questionnaire survey, we aimed to clarify the preferences of forest owners for the implementation of thinning practices. Based on this survey, we analyzed the preference of forest owners for types of thinning and examined the efficiency of forest management practices.

2. Methods

2.2. Study site

The study area was Hayakawa, Yamanashi Prefecture, Japan, with a total area of 369.9 km2, of which 98% is forest area. The population of the town in 1990 was 1,740, which is 26.5% of that in 1965. The average age is 56.8 years, and 47.2% of the population is over 65 years old. About 40% of forest owners are absentee landowners. The town is not only suffering from depopulation but also has an aging community. Because this town is not integrated with other cities, information on forests and land owners was gathered from a forest owners' cooperative in an integrated fashion. Basic information on forest owners was collected by Ito *et al.* (2006).

2.2. Questionnaire survey

We conducted a questionnaire survey in the study area in February 2007. We sent the questionnaire to 63 forest owners who had been recommended by the forest association in Hayakawa as highly motivated individuals. The questionnaires were sent by mail and re-sent by mail or fax. The number of valid responses was 46 (response rate: 73%).

The questions concerned methods of tree thinning, i.e., pre-commercial thinning, commercial thinning from below, or line

thinning, and their relative importance in making decisions for joint implementation of thinning. The questionnaire items were as follows:

Q1: How large an area of forest do you own?

Q2-1: Do you have any intention of implementing pre-commercial thinning?

Answer: 1. Yes; 2. No; 3. No idea.

Q2-2: This item relates to respondents answering "Yes" or "No idea" in Q2-1. Please choose one of the following items as a condition for implementation of pre-commercial thinning:

Answer: 1. No thinning costs; 2. Existing costs; 3. Inflationary costs.

Q3-1: Do you intend to implement commercial thinning from below?

Answer: 1. Yes; 2. No; 3. No idea.

Q3-2: This item relates to respondents answering "Yes" or "No idea" in Q3-1. Please choose one of the following items as a condition for implementing commercial thinning from below:

Answer: 1. No thinning costs; 2. High profits.

Q3-3: Do you intend to implement commercial line thinning?

Answer: 1. Yes; 2. No; 3. No idea.

Q3-4: This item is for respondents answering "Yes" or "No idea" in Q3-3. Please choose one of the following items as a condition for implementing commercial line thinning:

Answer: 1. No thinning costs; 2. High profits.

Q3-5: This item is for respondents answering "No" to Q3-3. Please select from the following items for not implementing commercial line thinning:

Answer: 1. Negative effect on the landscape; 2. Doubts over thinning effect derived from line thinning; 3. Possible increase in disturbance by wind; 4. Other.

Q4-1: Have you considered joint implementation of thinning?

Answer: 1. Yes; 2. No; 3. No idea.

Q4-2: This item is for respondents answering "Yes" or "No idea" to Q4-1. Please select from the following items reasons for agreeing to joint implementation of thinning:

Answer: 1. Clarifying forest owners who are to be involved in joint implementation; 2. Economic benefits derived from joint implementation; 3. Sharing forest roads; 4. Other.

Q4-3: This item is for respondents answering "No" to Q4-1. Please select from the following items reasons for disagreeing with joint implementation of thinning:

Answer: 1. Unclear which forest owners are involved in joint implementation; 2. Doubt over economic benefits derived from joint implementation; 3. Mixing of own harvested timber with that of others; 4. Other.

3. Results

3.1. Pre-commercial thinning

Figure 1-a shows the forest owners' responses regarding pre-commercial thinning; this is the cutting of trees not for immediate financial return. A total of 33% of respondents intended to implement pre-commercial thinning; 39% had no intention of implementing pre-commercial thinning; and 28% gave other reasons. More respondents had a negative attitude toward pre-commercial thinning than those having positive intentions to undertake pre-commercial thinning. Among forest owners other than those having no intention of implementing pre-commercial thinning, 46% said they would implement it if no cost was involved; 19% were willing to implement it at existing costs; and 35% would accept thinning costs in line with inflation (Fig. 1-b).

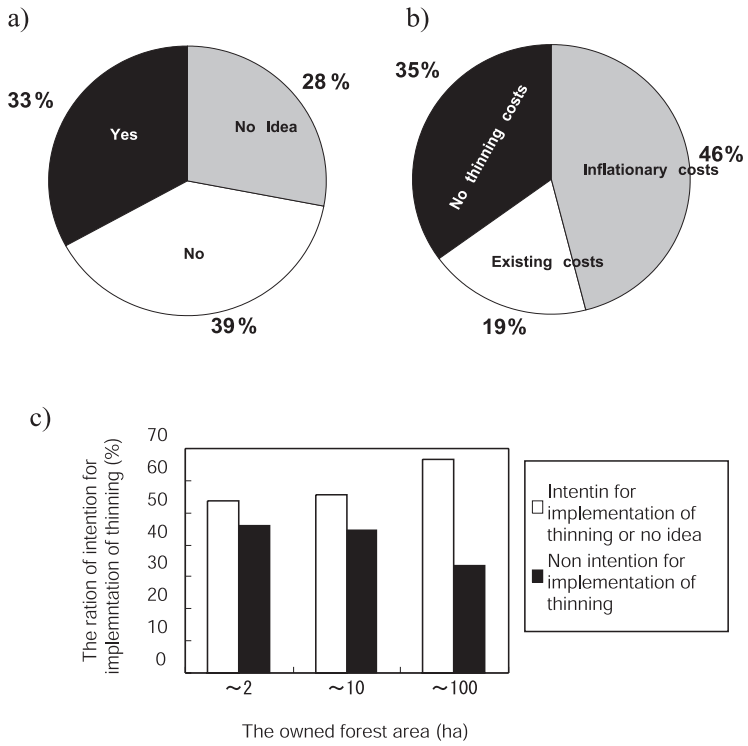

Figure 1.

a) Forest owner perceptions on pre-commercial thinning; b) Conditions for implementation of pre-commercial thinning; c) Relationships between owned forest area and intention to implement pre-commercial thinning.

These results were used to cross-tabulate preferences for pre-commercial thinning in relation to the forest area owned. Figure 1-c shows that those owning larger areas of forest had a more positive attitude toward pre-commercial thinning than those who owned smaller forests.

3.2. Commercial thinning from below

Figure 2-a shows the forest owners' responses in relation to commer-

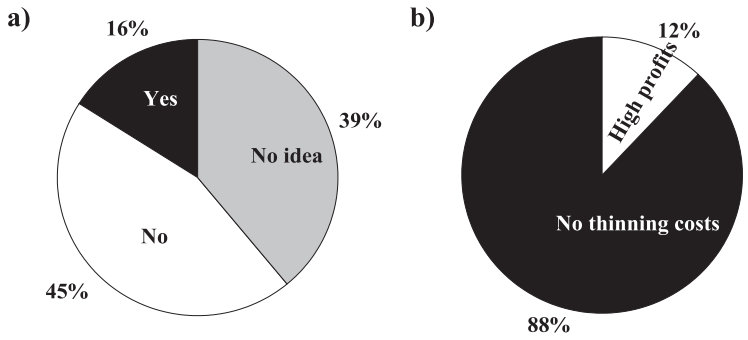

Figure 2.

a) Forest owner intention to implement commercial thinning from below; b) Conditions for implementation of commercial thinning from below.

cial thinning from below; this is the involving removal of trees from the lower crown classes for developing stand growth and immediate financial return. Sixteen per cent of respondents intended to implement commercial thinning from below; 45% had no intention of implementing commercial thinning from below; and other answers made up 39%. More respondents had a negative attitude to commercial thinning from below. Of the other respondents, 88% and 12%, respectively, said they would only implement commercial thinning if there were no harvesting costs or if high profits would accrue (Fig. 2-b).

3.3. Commercial line thinning

Figure 3-a shows the forest owners' attitudes about commercial line thinning; this is the removal of trees in strips for immediate financial return. Only 3% of respondents intended to implement commercial line thinning; 68% did not intend to implement commercial line thinning; and other answers from respondents constituted 29%. Many more respondents did not intend to undertake commercial line thinning. Among the respondents who answered "Yes" or "No idea", 77% and

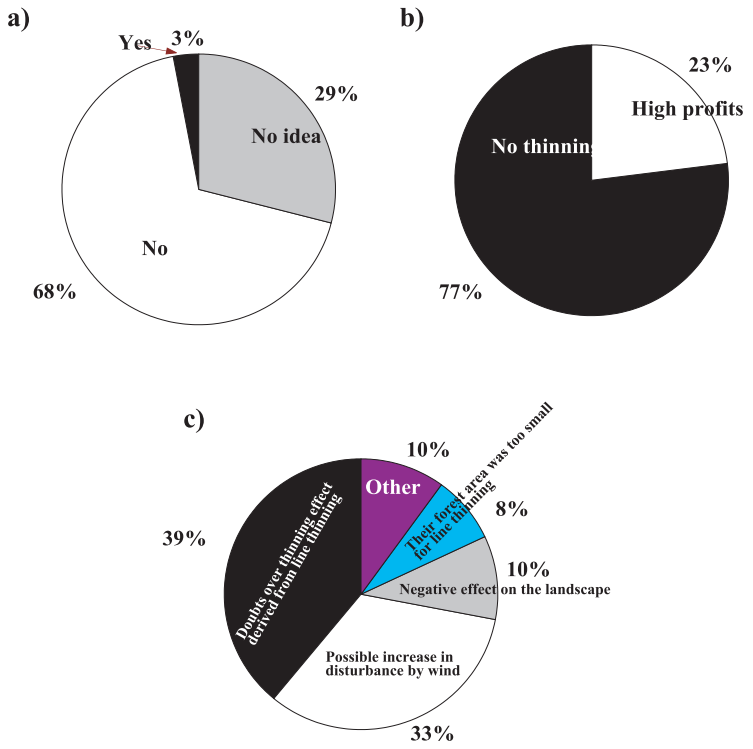

Figure 3.

a) Forest owner intention to implement commercial line thinning; b) Conditions for implementing commercial line thinning; c) Reasons for not implementing commercial line thinning.

23% would implement line thinning if there were no harvesting costs or if high profits would accrue, respectively (Fig. 3-b). Of those who had no intention to implement line thinning, 39% had doubts over its value; 10% thought it might increase wind disturbance or have a negative effect on the landscape; 8% said their forest area was too small for line thinning; and 10% gave other reasons for not implementing line thinning (Fig. 3-c).

3.4. Forest owners' attitudes toward joint implementation of thinning

Figure 4-a shows the forest owners' responses to joint implementation of thinning with other forest owners. A total of 29% of respondents intended to implement joint thinning; 39% did not intend to participate in joint thinning; and 32% of respondents gave other answers. There were more negative than positive responses regarding joint implementation of thinning. Of these respondents, 33% doubted the economic benefits derived from joint implementation; 29% were unclear on the involvement of other forest owners in joint implementation; 14% had areas of forest that are too small for joint implementation; 10% expressed concern over mixing their harvested timber with that of other people; and 14% gave other reasons for lack of involvement in joint implementation of thinning (Fig. 4-c). Of the forest owners who responded positively, 57% pointed out the benefits of cost reduction derived from joint implementation; 18% noted the advantage of shared use of forest roads; 11% stated that it would be necessary to clarify who the forest owners were; and 14% gave other reasons as a condition for joint implementation of thinning (Fig. 4-b).

From these results, cross tabulation of preference for joint implementation of thinning in relation to the preference for pre-commercial thinning was conducted (Fig. 4-d). More than half of forest owners not wishing to implement pre-commercial thinning also had negative attitudes to joint implementation. More than half of forest owners with no preference for pre-commercial thinning also had no preference for joint implementation. The tendencies were not as clear for forest owners who had positive attitudes to implementation of pre-commercial thinning. More than half of forest owners who had no preference for pre-commercial thinning showed a preference for joint implementation.

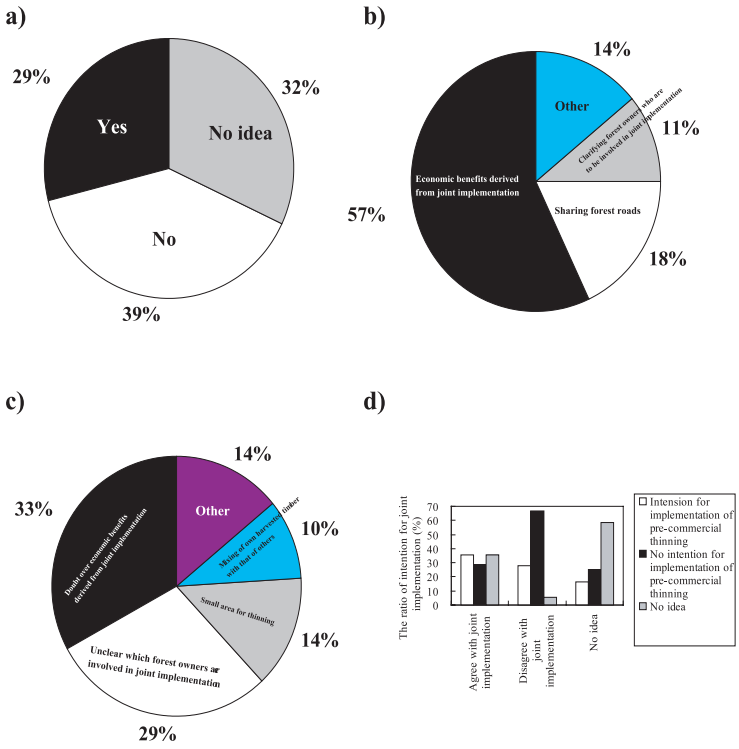

Figure 4.

a) Forest owner intention to implement joint thinning; b) Reasons for agreeing with joint implementation of thinning; c) Reasons for disagreeing with joint implementation of thinning; d) Relationship between owned forest area and the intention to implement pre-commercial thinning

4. Discussion

4.1. Pre-commercial thinning

The results showed that approximately half of respondents, other than those having no intention to implement pre-commercial thinning, will implement if thinning costs are not covered by them. This suggests that the forest owners rely on government subsidies, because pre-commercial thinning generally incurs costs for labor and does not

produce income. On the other hand, more than half of the positive respondents indicated a lack of existing thinning costs and inflationary costs as the conditions for implementation of pre-commercial thinning. With the cooperation of these forest owners, it may be possible to improve part of the managed forest area. Figure 1-c shows that owners of larger forest areas had more positive attitudes toward pre-commercial thinning, which was expected, because these individuals were more interested in the economic value of their forest resources.

4.2. Commercial thinning from below

Only 16% of forest owners intended to implement commercial thinning from below, compared to 33% intending to implement pre-commercial thinning. Comparing those owners considering commercial thinning from below to those considering pre-commercial thinning, respondents intending to implement thinning represented a 17% decrease.

Commercial thinning should generate a profit from the harvested timber. However, most forest owners indicated incurring no harvesting costs as the condition for implementation of commercial thinning from below (Fig. 1-b). This means that if harvesting income and expenditure provides a budget surplus, many forest owners might implement thinning, regardless of the amount of income produced. This also suggests that not only effective utilization of forest resources but also developing stands at suitable stand densities would be facilitated by turning harvesting income into a profit.

4.3. Commercial line thinning

Only 3% of forest owners expressed a positive response to line thinning, while 33% gave a positive response to pre-commercial thinning, and 16% would consider commercial thinning from below. The respondents who favored the implementation of line thinning, rather than

thinning from below, indicated large profits as a condition for implementation. These forest owners thought that the commercial dominant trees could be included among trees to be harvested by line thinning, a form of mechanical thinning.

Those who doubted the benefits of line thinning cited increasing wind disturbance as the most important factor in their decision. This could lead to a reduction in profits from final harvesting over stands thinned from below. Few studies (e.g. Nakajima *et al.*, 2009) have clarified the relationship between wind disturbances and thinning from below, and clarifying the impact of wind disturbance after line thinning would be also important for forest owners.

4.4. Forest owners' attitudes toward joint implementation of thinning

Forest owners were interested in reducing costs by joint implementation of thinning. It is therefore very important to quantify any reduction in harvesting costs obtained under joint implementation of thinning. The respondents not intending to participate in joint implementation were concerned about disputes between owners regarding implementation of thinning (e.g., the ownership of harvested timber). Therefore it is very important to establish a consensus process among forest owners for joint thinning practices.

5. Conclusion

A questionnaire survey was distributed among forest owners to examine their attitudes about implementing silvicultural practices of precommercial thinning, commercial thinning from below, line thinning, or joint implementation of thinning. The forest owners' interest in line thinning was relatively low. If harvesting income and expenditure were not negative, more than half of the forest owners, except those having

no intention to thin, intended to implement thinning. The important factor for forest owners as to whether to implement joint thinning was reducing the scale of harvesting cost. If we could show that harvesting income and expenditure could provide a profit for joint implementation of thinning with other forests owners, it might be possible to expand the managed plantation forest area under thinning by consensus with forest owners.

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間伐施業における森林所有者の意向調査に関する分析 − 山梨県早川町を事例として −

中島 徹・鹿又 秀聡・伊藤 勤・龍原 哲・白石 則彦

要約: 間伐による森林管理面積の拡大に向けて, 民有林経営における最終的な意思決定を行う森林所有者の意向を分析することは重要である. そこで, 本研究は, アンケート調査によって, 人工林で利用間伐面積を拡張するための施業や方策について森林所有者の意向を明らかにすることを目的とした. アンケート調査は, 町内に豊富な森林面積を有する山梨県早川町で実施し, 切捨て間伐, 利用間伐および他の森林所有者との施業の共同実施に関する意向を分析した. このとき, 利用間伐については, 下層間伐と列状間伐を区別して調査を行った. 併せて, 森林所有者には間伐の共同実施において重要となる判断基準についても質問した. その結果, 列状間伐に対する森林所有者の関心は相対的に低いことが明らかになった. また, 間伐に全く関心のない森林所有者を除く半数以上が, 間伐収支が赤字でなければ間伐を実施する意思があることがわかった. 他方, 間伐の共同実施に対する森林所有者の最も重要な判断材料は, スケールメリットによる搬出コストの削減であった. 以上から, 他の森林所有者との間伐の共同実施によって, 間伐収支が赤字とならないことが明らかになれば, 森林所有者の了解の下で間伐の実施面積を拡大し得る可能性が示唆された.

キーワード: アンケート調査, 間伐の共同実施, 森林所有者, 森林施業