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Production Structure of White Pine Cutting in Korea

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Korean major needle leaf tree and broad leaf tree account for 2,681 thousand and 1,659 thousand. The Korean tree species include 75% of larch, 16% of pine, 3% of rigida, and 3% of white pine, but for Gyeonggi-do, the number of white pine was the most among needle leaf trees and accounted for 34% of them. However, several conditions including lack of labors, insufficient forest management, and low wood price act as factors making the environment of forest management difficult. Accordingly, this study performed a study to identify management problems and promote activation of future forest management, against forest owners of white pine cutting in Gapyeong-gun, Gyeonggi-do, which was known as a representative pine nut producing district, accounting for 9% of the nationwide white pine forest area, 230 thousand ha. As results of the study, it was found that it was impossible practically to fell forest trees by its owner because of problems such as lack of labors and equipments and most of them didn't know existence and role of the Forestry Association well. One-sided presentation of timber price by timber dealers is likely to cause low profit of the forest owners and may be led to lowering of their forest management willing. Thus, it seems that more active action of the forestry association is required for efficient control and management of artificial forest in future and forest commencement such as pruning and thinning should be done in order to raise the price of forest tree price in the pulp material level to the level of timber price. And above everything, it was identified that in order to prepare insufficient financial resources for forest commencement, it was required to try to bring up whose purpose of forest possession was not maintenance of ancestral burial ground or property value, but true forest management.

Keywords: cutting, Korea, production structure, property, white pine

INTRODUCTION

The government has concentrated its investment including forest commencement on forest promotion zone for supply of industrial materials and expansion of forest product income source and earmarked 40.9 billion won of working expenses in 2010 for raising value added by strengthening competitive power of shore period income forest products. And it supported long-term low interest fund to forest owners and forestry workers timely to raise the competitive power of forestry and prepared 82.8 billion won of general fund for forest projects. In addition, the government strives for activation of forestry management by promoting various projects such as reorganization of national support system for private forest, rearing sincere forest managers and forest successors as the key managing body, construction of income safety net for forestry workers against natural disasters, improvement of forestry tax system, fostering the Forestry Association as a institution for forestry workers and forest owners, reorganization toward user centered technology training system, construction of private forest management system, and expansion of forest management plan establishment in the 5th Basic Forest Plan

for uplift of private forest competitive power. However low profitability, insufficient fund, lack of labor, imperfection of stable outlet, and low price of timber still make the forestry management difficult and the forestry managers insist mitigation of regulation for forest use, expansion of project fund support, and expansion of forestry technology guidance and management information supply as roles of the government (Kang and Kohroki, 2008a; Kang and Kohroki, 2008b; Seo *et al.*, 1999; Kim, 2010).

Accordingly, the purpose of this study is to identify management problems to promote activation of future forest management, against forest owners of white pine cutting in Gapyeong-gun, Gyeonggi-do, which was known as a representative pine nut producing district, accounting for 9% of the nationwide white pine forest area, 230 thousand ha.

MATERIALS AND METHODS

First for the cutting status of Gapyeong-gun for 5 years from 2005 to 2009, it was found that number of cutting forest owners was 414 man-days, its cutting area was 765 ha, and its cutting volume was 22,560 m³. Among the above results, 73% of the forest owners, 77% of the area, and 47% of the volume was thinning and by tree species, white pine was the most, accounting for 60% of the forest owners, 67% of the area, and 50% of the volume. The cutting forest owners which was 414 man-days consisted of 175 man-days of resident forest owner and 239 man-days of absentee forest owner and by their management scales, the forest owners possessing 1~3

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and less than 1 ha accounted for the majority as 43% and 41% (Gapyeong-gun, 2010a; Gapyeong-gun, 2010b; Gapyeong-gun, 2010c).

Besides, although a direct survey was conducted against 93 forest owners located in Gapyeong-gun who executed cutting for 5 years from 2005 to 2009, it was successful on only 41 persons with reasons such as missing, refusal, long term outing, and moving out to other districts. By regions, the subjects consisted of 6 persons in Gapyeong-eup, 14 persons in Seolak-myeon, 3 persons in Cheongpyeong-myeon, 2 persons in Buk-myeon, 7 persons in Ha-myeon, and 9 persons in Sang-myeon.

This survey was executed for 2 months from early March to middle May 2010 and its contents included white pine cutting area, cutting tree volume, timber sales income, forest commencement record, operating body of cutting, forest management plan, forest management

conditions and difficulties. Data were compared and analyzed by ages and forest management scales.

RESULTS AND DISCUSSIONS

Forest area by tree species and white pine forest in Korea

Total area of needle forest and broad-leaf forest in Korea is 4,340 thousand ha, which consists of 2,681 thousand (62%) of needle forest and 1,659 thousand (38%) of broad leaf forest. White pine forest took 5% of total forest area and 9% of needle forest and by regions, Gangwon-do has 77 thousand ha, followed by Gyeonggi-do with 65 thousand ha and Gyeongsangbuk-do with 28 thousand ha. For regions with higher ratio of white pine forest in needle forest, Gyeonggi-do has the highest ratio of white pine forest as 34%, followed by Gangwon-do with 16%

Table 1. Forest area by main tree species

(Unit: thousand ha)

Classification	Total	Needle-leaf trees					Broad-leaf trees	
		Subtotal	Pine	Larch	Rigida	White pine	Others	Subtotal
Total	4,340	2,681 (100)	1,473	462	407	230 (9)	109	1,659
Gyeonggi-do	377	192 (100)	12	50	64	65 (34)	1	185
Gangwon-do	944	474 (100)	251	140	3	77 (16)	3	470
Chungcheongbuk-do	358	232 (100)	48	111	46	26 (11)	1	126
Chungcheongnam-do	314	198 (100)	79	15	93	9 (5)	2	116
Jeollabuk-do	345	194 (100)	94	20	60	13 (7)	7	151
Jellanam-do	521	394 (100)	250	1	69	4 (1)	70	127
Gyeongsangbuk-do	804	563 (100)	415	94	22	28 (5)	4	241
Gyeongsangnam-do	457	312 (100)	248	27	25	5 (2)	7	145
Others	220	122 (100)	76	4	25	3 (2)	14	98

Source: Forest Service, 2009 *Statistical Yearbook of Forestry*

Note: The value in () is the component ratio.

Table 2. Supply amount of domestic wood materials for lumbering

(Unit: m³)

		Larch	Pine	Rigida	White pine	Cedar	Others
Needle-leaf trees	519,032 (100)	387,962 (75)	84,303 (16)	17,898 (3)	17,574 (3)	7,657 (2)	3,638 (1)
Broad-leaf trees	40,631 (100)	Oak	White Birch	Birch	Ash	Others	–
		104 (94)	826 (2)	629 (2)	576 (1)	496 (1)	–

Source: Forest Service, 2009 *Research on the Actual Condition of Wood Application in 2008*

Note: The value in () is the component ratio.

and Chungcheongbuk-do with 11% (Korea Forest Service, 2009a).

In addition, it was found also that overall supply amount of domestic wood materials for lumbering was 559,663 and comprised 93% of needle-leaf trees and 7% of broad-leaf trees, showing that needle-leaf trees took the majority. By tree species, it was found that the needle-leaf trees consisted of 75% of larch, 16% of pine, 3% of *Rigida*, and 3% of White pine. For broad-leaf trees, it was shown that oaks accounted for the majority, including other tree species such as white birch, birch, and ash

(Korea Forest Service, 2009b).

Status of subject regions in case study

Forest areas and white pine forest by ownerships

First, for the forest areas of Gapyeong-gun, the subject region of this survey, it was found that its total forest area, 69 thousand ha, consisted of 54% of private forest, 32% of provincial forest, 13% of national forest, and 1% of military forest, where White pine forest accounted for 30% of total forest area. The area ratio of white pine forest by ownerships consisted of 54% of private forest, 32%

Table 3. Area of forest and white pine forest by ownerships in the subject regions

(Unit: ha)					
Classification	Total	National forest	Provincial forest	Military forest	Private forest
Gapyeong-gun	69,071 (100)	8,715 (13)	22,419 (32)	857 (1)	37,080 (54)
White pine forest	0,651 (100)	1,173 (6)	5,385 (26)	unclear	4,093 (68)

Source: 1. Forest Service. 2009 *Statistical Yearbook of Forestry*

2. Gapyeong-gun. 2008 *Planted area of white pine*

Note: The value in () is the component ratio.

Table 4. Cutting status of Gapyeong-gun by tree species

Classification		Total			2005			2006			2007			2008			2009		
		Total	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting
Total	Forest owner (person)	414 (100)	303 (73)	111 (27)	33	30	3	53	38	15	119	80	39	96	79	17	113	76	37
	Area (ha)	765 (100)	590 (77)	175 (23)	61	56	5	74	57	17	191	147	44	164	146	18	275	184	91
	Volume (m ³)	22,560	10,511 (47)	12,055 (53)	1,606	977	629	2,453	1,348	1,105	4,910	2,196	2,714	4,527	2,941	1,586	9,071	3,049	6,022
White pine	Forest owner	250 (60)	220	30	24	22	2	31	28	3	61	54	7	60	53	7	74	63	11
	Area	513 (67)	466	45	49	48	1	47	45	2	117	114	3	114	109	5	186	152	34
	Volume	11,311 (50)	8,205	3,106	907	849	58	1,129	1,008	121	2,225	1,719	506	2,676	2,208	468	4,378	2,421	1,953
Larch	Forest owner	79	51	28	7	6	1	9	4	5	28	18	10	17	14	3	18	9	9
	Area	97	68	29	8	4	4	10	5	5	28	20	8	20	15	5	31	24	7
	Volume	4,747	1,492	3,255	661	91	570	803	249	554	1,021	356	665	800	372	428	1,462	424	1,038
Oak	Forest owner	51	25	26	–	–	–	7	5	2	13	7	6	13	9	4	18	4	14
	Area	122	48	74	–	–	–	11	7	4	27	12	15	28	21	7	56	8	48
	Volume	4,810	729	4,081	–	–	–	213	85	128	672	114	558	910	326	584	3,015	204	2,811
<i>Rigida</i> Pine	Forest owner	19	3	15	–	–	–	2	–	2	9	1	8	4	2	2	3	–	3
	Area	24	2	22	–	–	–	5	–	5	15	1	14	2	1	1	2	–	2
	Volume	1,880	35	1,338	–	–	–	270	–	270	761	7	754	122	28	94	220	–	220
Chestnut tree	Forest owner	7	–	7	–	–	–	1	–	1	6	–	6	–	–	–	–	–	–
	Area	2	–	2	–	–	–	–	–	–	2	–	2	–	–	–	–	–	–
	Volume	132	–	132	–	–	–	17	–	17	115	–	115	–	–	–	–	–	–
Others	Forest owner	8	3	5	1	1	–	3	1	2	2	–	2	2	1	1	–	–	–
	Area	7	4	3	4	4	–	1	–	1	2	–	2	–	–	–	–	–	–
	Volume	194	51	143	38	38	–	21	6	15	116	–	116	19	7	12	–	–	–

Note: The number of forest owners is the total number of man-days.

of provincial forest, and 13% of national forest (Korea Forest Service, 2009a; Gapyeong-gun, 2008).

Status of cutting and forest owner by tree species in Gapyeong-gun

For the cutting record of Gapyeong-gun for 5 years from 2005 to 2009, it was found that number of the forest owners was 414 man-days, its cutting area was 765 ha, and its cutting volume was 22,560 m³. It was true that its cutting amount was increasing every year. While thinning accounted for 73% of total forest owners and 77% of the cutting area, clear cutting accounted for 53% of the cutting volume. By tree species, it was found that cutting ration of white pine was the highest (Gapyeong-gun. 2010a; Gapyeong-gun. 2010b; Gapyeong-gun. 2010c).

For the status of forest owner location, it was found that the ratio of resident forest owners who lived in Gapyeong-gun was 42% and they accounted for 44% of

the area and 37% of the volume. For the absentee forest owner, Seoul and Gyeonggi accounted for the majority as 23% and 22% (Gapyeong-gun. 2010a; Gapyeong-gun. 2010b; Gapyeong-gun. 2010c).

For cutting status by forest owning scales, it was found that forest owner classes having less than 1 ha and 1~3 ha had 41% and 43% of total forest owners respectively, forest owner classes having 1~3 ha and less than 5 ha accounted for 40% and 27% of the area, and forest owner classes having 1~3 ha and less than 5 ha accounted for 44% and 21% of the volume (Gapyeong-gun. 2010a; Gapyeong-gun. 2010b; Gapyeong-gun. 2010c).

Case Study

Forest owning structure and tree species composition

Mean age of 41 forest owners, the subjects of this survey, was 57 years old and persons in his fifties and sixties was the most as 13 and 11 persons respectively.

Table 5. Cutting status of Gapyeong-gun by locations of its forest owners

Classification		Total			2005			2006			2007			2008			2009		
		Total	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting
Total	Forest owner (person)	414 (100)	303	111	33	30	3	53	38	15	119	80	39	96	79	17	113	76	37
	Area (ha)	765 (100)	590	175	61	56	5	74	57	17	191	147	44	164	146	18	274	184	90
	Volume (m ³)	22,566 (100)	10,511	12,055	1,606	977	629	2,453	1,348	1,105	4,910	2,196	2,714	4,527	2,941	1,586	9,071	3,049	6,022
Resident forest owner	Forest owner	175 (42)	132	43	15	15	–	15	10	5	59	40	19	41	36	5	45	31	14
	Area	335 (44)	267	68	37	37	–	20	15	5	85	63	22	78	66	12	115	86	29
	Volume	8,428 (37)	4,652	3,776	598	598	–	632	365	267	2,380	969	1,411	2,211	1,318	893	3,393	1,402	1,205
Seoul	Forest owner	96 (23)	72	24	8	6	2	15	10	5	26	19	7	23	21	2	24	16	8
	Area	194 (25)	151	43	16	11	5	22	14	8	53	46	7	40	33	7	63	47	16
	Volume	6,076 (27)	2,715	3,361	822	236	586	928	273	655	929	634	295	1,367	756	611	2,030	816	1,214
Gyeonggi	Forest owner	92 (22)	63	29	8	7	1	13	8	5	27	15	12	15	14	1	29	19	10
	Area	153	122	31	7	7	–	14	10	4	47	33	14	25	25	–	60	47	13
	Volume	4,195	1,930	2,265	148	106	42	350	167	183	1,330	471	859	509	427	82	1,858	759	1,099
Absentee forest owner	Forest owner	22	20	2	–	–	–	8	8	–	3	3	–	–	–	–	11	9	2
	Area	38	16	22	–	–	–	11	11	–	2	2	–	–	–	–	25	3	22
	Volume	1,879	514	1,365	–	–	–	408	408	–	47	47	–	–	–	–	1,424	59	1,365
Incheon	Forest owner	13	12	1	2	2	–	1	1	–	3	3	–	6	6	–	1	–	1
	Area	23	17	6	1	1	–	3	3	–	3	3	–	9	9	–	6	–	6
	Volume	1,353	472	881	37	37	–	57	57	–	75	75	–	303	303	–	881	–	881
Chungcheong	Forest owner	5	3	2	–	–	–	–	–	–	1	–	1	2	2	–	2	1	1
	Area	5	3	2	–	–	–	–	–	–	1	–	1	2	2	–	2	1	1
	Volume	380	150	230	–	–	–	–	–	–	149	–	149	137	137	–	94	13	81
Others	Forest owner	2	1	1	–	–	–	1	1	–	–	–	–	–	–	–	1	–	1
	Area	7	4	3	–	–	–	4	4	–	–	–	–	–	–	–	3	–	3
	Volume	255	78	177	–	–	–	78	78	–	–	–	–	–	–	–	177	–	177

Note: The number of forest owners is the total number of man-days.

Table 6. Cutting status of Gapyeong-gun by forest owning scales

Classification		Total			2005			2006			2007			2008			2009		
		Total	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting	Subtotal	Thinning	Clear cutting
Total	Forest owner (person)	414 (100)	303	111	33	30	3	53	38	15	119	80	39	96	79	17	113	76	37
	Area (ha)	765 (100)	590	175	61	56	5	74	57	17	191	147	44	164	146	18	275	184	91
	Volume (m³)	22,566 (100)	10,511	12,055	1,606	977	629	2,453	1,348	1,105	4,910	2,196	2,714	4,527	2,941	1,586	9,071	3,049	6,022
<1ha	Forest owner	169 (41)	112	57	14	12	2	31	19	12	56	34	22	38	27	11	30	20	10
	Area	93 (12)	59	34	7	6	1	15	11	4	23	15	8	20	14	6	28	13	15
	Volume	3,519 (16)	1,505	2,014	188	129	58	584	310	274	1,093	359	734	799	366	432	857	341	516
1~3ha	Forest owner	177 (43)	139	38	14	14	–	15	14	1	44	32	12	47	41	6	57	38	19
	Area	304 (40)	239	65	20	20	–	28	25	3	75	57	18	84	72	12	97	65	32
	Volume	9,983 (44)	4,803	5,180	379	379	–	668	579	89	2,037	855	1,182	2,904	1,750	1,154	3,995	1,240	2,755
3~5ha	Forest owner	41 (10)	29	12	3	2	1	5	4	1	14	9	5	7	7	–	12	7	5
	Area	158 (21)	114	44	11	7	4	18	14	4	56	39	17	29	29	–	44	25	19
	Volume	4,392 (19)	1,735	2,657	659	89	570	461	299	162	1,331	533	798	440	440	–	1,501	374	1,127
>5ha	Forest owner	27 (7)	23	4	2	2	–	2	1	1	5	5	–	4	4	–	14	11	3
	Area	210 (27)	178	32	23	23	–	13	7	6	37	37	–	31	31	–	106	81	25
	Volume	672 (21)	2,468	2,204	380	380	–	740	160	580	449	449	–	385	385	–	2,718	1,094	1,624

Note: The number of forest owners is the total number of man-days.

The forest owners in his forties and seventies was 6 persons respectively and the forest owner in his thirties was 5 persons. While the forest owning scale was 5.1 ha per forest owner, the number of forest owners with less than 1 ha was 4, 1~3 ha was 16, 3~5 ha was 9, 5~10 ha was 6 and above 10 ha was 6.

For tree species of the owned forest, it was found that white pine took the greatest part as 75%, followed by 12% of Oak and 9% of Pine and the white pine accounting for the largest part was mainly 30~40 years old.

Although there was a case that Larch was planted newly after clear cutting, 30~40 year old trees accounted

for the majority of them (Table 7).

Forest commencement and future plan

For status of forest commencement, it was found that 10 persons among 41 forest owners executed removal of miscellaneous trees and vines and pruning and that by their ages, the forest owners in 50's accounted for the highest ratio as 6 persons among the 13 forest owners. 1 fruit tree planning and 1 industrial crop planting forest owner planted mulberry and wood-cultivated ginseng respectively. For forest production, it was found that fuel was 4, fruit harvest was 2, and wild edible greens was 1 and the fuel was for heating, the fruit was pine nuts

Table 7. Composition by tree species

Classification	Total	White pine	Oak	Pine	Larch	(Unit: ha)
						Vacant Land
Total(41)	208.3 (100)	157.0 (75)	25.2 (12)	19.4 (9)	6.2 (3)	1.3 (1)
<1 ha (4)	2.2	1.7	–	–	–	0.5
1~3 (16)	25.7	25.0	–	–	0.7	–
3~5 (9)	32.1	29.6	1.7	–	–	0.8
5~10 (6)	40.5	25.3	10.7	–	4.5	–
>10 (6)	107.8	74.6	12.8	19.4	1.0	–

Note: 1. Value in () of the above Classification is number of forest owners.

2. The value in () is the component ratio.

and the wild edible greens was bud of aralia elater. However there was no income by selling them excluding 10.3 million won of 2 pine nut producing owners because the fuel and the wild greens was for their own use. For pine nut gathering, they answered that although the pine nut gathering was still active due to pine nut processing plants locating nearby and that the number of pine nut collectors was decreasing by reason of rising labor cost, risk bearing and decrease of fruiting amount.

For the center of household economy, it was found that agriculture took the largest part as 23 persons in 41 subjects and when the age was lower and the forest owning scale was smaller, the number of answers that center of household economy was business owner and live stock

was more. For managing land scale, it was shown that the number of persons who answered maintenance of quo was the most as 29 persons. However, 8 persons who answered to wish expansion included 3 persons for agriculture, 3 persons for property, and 2 persons with no response and 4 persons who answered reduction involved 1 person from lack of labor, 1 person from low profitability, and 2 persons from economic circumstances.

For forest land, it was found that 6 persons who answered expansion involved 2 persons for property value, 1 person for land reclamation, 1 person for timber merchant, 1 person for operation of training institute, and 1 person for pine nut gathering. The persons who answered maintenance of quo included 6 persons for

Table 8. Forest commencement and production state (during recent 5 years)

(Unit: person)

Classification		Commencement				Production			
		Total	Removal of miscellaneous trees and vines pruning	Fruit tree planting	Industrial crop planting	Total	Fuel	Fruits	Wild greens
Total		12	10	1	1	7	4	2	1
By ages	30's (5)	1	1	—	—	2	1	—	1
	40's (6)	2	—	1	1	2	1	1	—
	50's (13)	6	6	—	—	3	2	1	—
	60's (11)	2	2	—	—	—	—	—	—
	>70's(6)	1	1	—	—	—	—	—	—
By forest owning scales	<1 ha(4)	—	—	—	—	1	—	1	—
	1~3 ha(16)	4	3	—	1	3	1	1	1
	3~5 ha(9)	3	3	—	—	2	2	—	—
	5~10 ha(6)	4	3	1	—	—	—	—	—
	>10 ha(6)	1	1	—	—	1	1	—	—

Note: The value in () in the above Classification is the number of forest owners.

Table 9. Agro-forestry management plan

(Unit: person)

Classification		Center of household economy							Scale of managing land				Forest management scale			
		Total	Agriculture	Business owner	Live-stock	Constant forestry work	Temporary forestry work	Inoccupation	Pension	Remittance	Expansion	Maintenance of quo status	Reduction	Expansion	Maintenance of quo status	Reduction
Total		41 (100)	23 (56)	8	3	3	1	1	1	1	8	29 (71)	4	6	28 (68)	7
By ages	30's	5	1	2	1	—	1	—	—	—	4	1	—	3	1	1
	40's	6	2	1	1	2	—	—	—	—	2	4	—	2	3	1
	50's	13	8	3	—	1	—	1	—	—	—	10	3	1	9	3
	60's	11	8	2	—	—	—	—	1	—	1	9	1	—	9	2
	>70's	6	4	—	1	—	—	—	—	1	1	5	—	—	6	—
By forest owning scales	<1ha	4	2	—	—	2	—	—	—	—	1	2	1	—	3	1
	1~3	8	8	5	1	—	1	—	—	1	5	11	—	5	11	—
	3~5	9	6	2	1	—	—	—	—	—	2	6	1	—	7	2
	5~10	6	4	—	1	1	—	—	—	—	—	6	—	—	4	2
	>10	6	3	1	—	—	—	1	1	—	—	4	2	1	3	2

Note: The value in () is the component ratio.

property value and 22 persons for succession and all of 7 persons planning reduction answered low profitability.

Status of cutting area and volume

Total cutting area and cutting volume of 41 forest owners, the subjects of this survey was 72.2 ha and 1,651 m³ and among them, thinning accounted for the majority as 67.1 ha and 1,389 m³ respectively. The cutting area and cutting volume per forest owner was 1.8 ha and 40.3 m³, but 40 forest owners executed the cutting work by requesting timbering merchants and 1 owners did it by requesting the Forest Association. As shown in the

above results, the reason for the most of forest owners to request the cutting work to the timber dealer was that the timer dealer carried out all of administrative procedures as proxy of forest owner to reduce troubles in the forest owner position. In addition, as the timber dealers lived in same or adjacent regions, it was easy for the forest owners to request cutting. And, it was impossible practically to fell forest trees by its owner because of problems such as lack of labors and equipments and most of forest owners didn't know existence and role of the forest association well. Besides, although most of

Table 10. Cutting area and cutting volume

Classification		Total	Clear cutting	Thinning
Total	Area (ha)	72.2(100)	5.1(7)	67.1(93)
	Volume (m ³)	1,651(100)	262(16)	1,389(84)
White pine	Area (ha)	71(98)	4.4	66.6
	Volume (m ³)	1,592(96)	223	1,369
Oak	Area (ha)	0.7	0.7	–
	Volume (m ³)	39	39	–
Larch	Area (ha)	0.5	–	0.5
	Volume (m ³)	20	–	20

Note: The value in () is the component ratio.

Table 11. Cutting area and cutting volume

Classification		Forest area (ha)	Cutting area (ha)	Cutting volume (m ³)	Cutting income (10 thousand won)	Cutting area/forest area (%)	Cutting volume/cutting area (ha)	Income/owner (10 thousand won)	Income/cutting area (10 thousand won)	Income/cutting volume (10 thousand won)
Total (41)		208.3	72.2	1,651	10,020 (35)	35	23	286	139	6
By ages	30's (5)	7.3	5.6	135	1,050 (4)	77	24	263	188	8
	40's (6)	25.2	6.3	117	520 (4)	25	19	130	83	4
	50's (13)	49.4	17.4	602	2,430 (10)	35	35	243	140	4
	60's (11)	104.6	27.8	456	3,520 (11)	27	16	320	127	8
	>70's (6)	21.8	15.1	341	2,500 (6)	69	23	417	166	7
By forest owning scales	<1 ha (4)	2.2	2.2	61	50 (1)	100	28	50	23	1
	1~3 (16)	25.7	20.1	545	3,030 (15)	63	27	202	151	6
	3~5 (9)	32.1	21.6	398	4,050 (9)	67	18	450	188	10
	5~10 (6)	40.5	14.6	242	1,970 (5)	36	17	394	135	8
	>10 (6)	107.8	13.7	405	920 (5)	13	30	184	67	2

Note: 1. Value in () of the above classification is number of forest owners.

2. Value in () of the income was the number of forest owners with income.

3. Clear cutting area was 5.1ha and clear cutting volume was 26.2 m³.

4. For the income/owner (10 thousand won), only forest owner with income was applied.

the forest owners answered that they would request also their cutting related works to timber dealers in future, the one-sided presentation of timber price by the subjectivity of timber dealers may cause problems including low income of the forest owner and may be connected to lowering of willing for forest management.

For cutting status of 41 subjects, it was found that the ratio of cutting area against forest area was the largest in 30's as 77% and by forest owning scales, it was shown that the class with <1 ha was the highest as 100%, but when the scale was greater, the cutting ratio was lower. The cutting volume per ha was 23 and average cutting income of 35 forest owners who had had cutting income was 2.86 million won. The cutting income per ha was 1.39 million won and the timber price per volume was 10~100 thousand won, averaging 60 thousand won. Besides, as it was needed to estimate forest tree volume of the subject forest land in order to fix the price of forest tree, but the timber dealers estimate the forest tree price from total volume regardless of tree species including white pine, larch and oak to present it to the forest owners. For the presented price of forest trees, the forest owners would agree, or when they were unsatisfied with it, price adjustment between the dealer and the owner would be done. And, it was found that the reason that the unit price of forest tree per volume was different in spite of same tree species was because it was influenced largely from geographical conditions of forest land such as timber carry-out distance and slope and timber condition such as thickness and insect pest damage. Thus, it was suggested that the unit price per volume was not associated greatly with cutting area and volume. Forest owners with no income were the cases that a timber dealer took their forest trees without charge for cutting charge. Most of these cases were that quality of trees was not so good or they were thin, cutting land was rapid slope, or its geographical condition was poor from long carry-out distance. Besides, the price of domestic timber per as of December, 2008 was 200 thousand won of pine, 110 thousand won of larch, 90 thousand of ordinary noncoifers, 70 thousand won of pit prop wood, and 60 thousand won of pulp wood (Kang and Kohroki, 2008b).

Difficulties on forest management

For difficulties on forest management, most of forest owners answered low profitability. The purpose of expansion of forest management scale included property value, reclamation, and operation of training institute rather than true forest management and the forest owners wishing reduction accounted for 17%. In addition, most forest owners including possessing forest for the purpose of ancestral burial ground and property value answered that they were unsatisfied to tax imposed every year in spite of no income from the forest rather than to support from the government.

CONCLUSION

1. Among the major needle-leaf trees in Korea, white pine forest accounted for 5% of total forest area and

9% of need-leaf forest area and among the needle leaf trees, the regions with higher ratio of white pine forest were 34% of Gyeonggi-do, 16% of Gangwon-do, and 11% of Chungcheongbuk-do.

2. The white pine forest of Gapyeong-gun, the subject region of this survey, accounted for 30% of its total forest area and the area ratio of *white pine* forest by ownerships consisted of 54% of private forest, 32% of provincial forest, and 13% of national forest.
3. For the cutting record of Gapyeong-gun for 5 years from 2005 to 2009, it was found that number of the forest owners was 414 man-days, its cutting area was 765 ha, and its cutting volume was 22,560 m³. The cutting ratio of white pine was the highest.
4. Mean age of 41 forest owners, the subjects of this survey, was 57 years old and persons in his fifty and sixty was the most as 13 and 11 persons respectively. Their forest owning scale was 5.1 per forest owner. White pine accounted for the greatest part as 75%, which were mainly 30~40 years old.
5. Total cutting area and cutting volume of 41 forest owners, the subjects of this survey was 72.2 ha and 1,651 m³ and among them, thinning accounted for the majority as 67.1 ha and 1,389 m³ respectively. The cutting area and cutting volume per forest owner was 1.8 ha and 40.3 m³, but 40 forest owners executed the cutting work by requesting timbering merchants and 1 owner did it by requesting the Forest Association.
6. The cutting volume per ha was 23 m³ and average cutting income of 35 forest owners with cutting income was 2.86 million won. The cutting income per ha was 1.39 million won and the timber price per volume was 10~100 thousand won, averaging 60 thousand won.

Therefore, in order to activate forest management as well as white pine forest of Gapyeong-gun, it is considered that following measures should be prepared.

1. Forest cutting by forest owner's own strength is impossible practically because of insufficient labor and equipments. Thus, it is needed to induce their interest on forest management by providing convenience and brining more profit to them through active execution of cutting by the Forest Association, which is an organization for the forest owners and supported by the government.
2. Although the felled white pine timbers were sold 60 thousand won per on the average, but it was the level of pulp wood price. In order to secure higher timber price in future, it is required to try to produce good quality wood via forest commencement including pruning and thinning and it seems that a measure to support the forest commencement budget preferentially to the forest owners who are active in forest management is also needed.
3. It was found that the unit price of forest tree per volume was influenced greatly by several factors such as timer carry-out distance, slope, thickness, and damage of insect pest. Therefore, it is required to

raise productivity of forest management through continuous promotion of private forest management system establishment project by the government.

4. Finally, it is urgent to improve forest taxation system including exemption of tax imposed on forest with no income and it is also required to prepare a measure to raise insufficient financial resources for forest commencement through introduction of local government specific systems such as forest environment tax by considering long term feature and low profitability, which are specific for forest management. And the government should try to bring up forest owners aiming at forest management rather than ancestral burial ground or property value by promoting an internal economization measure for public benefit functional of forest.

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