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<https://doi.org/10.5109/25212>

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出版情報：九州大学大学院農学研究院紀要. 57 (2), pp.499-505, 2012-09-20. Faculty of  
Agriculture, Kyushu University

バージョン：

権利関係：



## Study on Management of Provincial Forest in Korea

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(Received April 27, 2012 and accepted May 10, 2012)

While Korean provincial forest is 154,000 ha corresponding to 2.4% of total forest area, 6,380,000 ha, continuous investment has been given to formation of forest management basis such as forest road construction and forestation and it helps local economy via lending, permission for use, and paid or non–paid donation of forest product to local residents. In addition, although it seems that functions and roles of provincial forest such as absorption of demand for forest leisure will be increased further, there is actually few direct study on management form and use of provincial forest. Thus, management and utilization forms were investigated against 5 provincial forests in the whole country. As results, it was found that average annual revenue of 4 provinces excluding 1,500 million won from sale of provincial forest in Chungnam was 92 million won and the mean estimated expenditures was 2,838 million won. Although the area of lending and use permission of national forest accounted for 4.5% of total area of national forest, the subjected 5 provinces accounted for 3.3%. The average earning of the 5 provinces from their provincial property was 51.61 million won, which was very low level, accounting for 1.8% of the average annual expenditure of 5 provinces, 2,838 million won. Therefore, it was considered that for future development of provincial forest, positive efforts for marketing the thinned wood and byproducts for securing estimated revenues that was markedly lower than the annual expenditures would be necessary in addition to intensive use of provincial forest by expanding further lending and use permission to their residents. Finally, in order to suggest developmental measures for provincial forest of each province concretely it was identified that there was a need for analysis on multilateral aspects such as forest type, long term management goal, and environmental conditions by provincial forests.

**Keywords:** forest type, forest projects, Korea, provincial forest, provincial property

### INTRODUCTION

Possession type of forest is divided largely into national forest and civil owned forest and the national forest is classified into forest under jurisdiction of Forest Service and forest under other authorities. The civil owned forest is divided into public forest and private forest and the public forest is classified into provincial forest administered by each province and county forest administered by local governments such as city and county.

Although the provincial forest, 154,000 ha, accounted for low level, 2.4% of total forest area 6.38 million ha (Forest Service, 2008a), it has formed forest management basis such as forest road installation and forestation with continuous investment. In addition, it helps local economy via lending, permission for use, and paid or non–paid donation of forest product to local residents and it seems that functions and roles of provincial forest such as absorption of fast increasing demand for forest leisure as well as nature lessons, leisure, and forest byproduct production, will be increased further. Besides most of studies on administration and management of provincial forest were performed on collection of forest

products made in the provincial forest (Forest Service, 2008b; Park *et al.*, 1987a; Park *et al.*, 1987b), drawing up of forest function classification diagram of public forest, forest function assessment of public forest (Kwon *et al.*, 2008), and development of forest administration system using geographic information system (Jeon, 2002) and direct study on management forms and uses of provincial forest was scarce actually. Therefore, the purpose of this study is to grasp problems and seek future direction for development in management of provincial forest by investigating their management and use forms against 5 provincial forests in the whole country.

### MATERIALS AND METHODS

The field investigation was performed via interview with persons responsible for them against 5 provincial forests of 5 provinces such as Gyeonggi, Gangwon, Chungnam, Jeonbuk, and Gyeongnam among 8 provinces in the whole Korea. The field survey was conducted for 4 months from March to June, 2009, of which contents included status of area and accumulation of provincial forest, wood accumulation by age groups, status of revenue and expenditure of the provincial forest, status of lending and use permission of provincial property, earning status of provincial property, and major forest projects of provincial forest. Data were compared and analyzed by provinces.

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## RESULTS AND DISCUSSIONS

**Area and accumulation status of provincial forest***Area and forest tree accumulation of provincial forest*

For area and forest tree accumulation of provincial forests of 5 provinces targeted among total 8 provinces excluding Jeju-do, it was found that average area of the whole provincial forests was about 7 million ha and Gangwon-do has the largest area as 1.37 million ha, followed by Gyeongnam with 0.71 million ha, Gyeonggi with 0.53 million ha, Jeonbuk with 0.45 million ha, and Chungnam with 0.44 million ha. It was found also that the average area of provincial forests was 19,000 ha and Gyeonggi had the largest area as 31,000 ha, followed by Gangwon with 29,000 ha and Gyeongnam with 16,000 ha. Jeonbuk and Chungnam had 11,000 ha of average area respectively. For the ratio taken by provincial forest in the whole forest area of the provinces, it was shown that Gyeonggi had the greatest ratio as 5.9% and the ratio of other 4 provinces was 2.1~2.5%. In addition, the average forest tree accumulation of total provinces was 73 million and among them, Gangwon had the largest accumulation as 168 million m<sup>3</sup>, followed by Gyeongnam with 63 million and Jeonbuk with 47 million m<sup>3</sup> (Forest Service,

2008a). The average tree accumulation of each provincial forest was 2.1 million m<sup>3</sup> and Gyeonggi had the most value with 3.4 million m<sup>3</sup>, followed by Gangwon with 3.0 million m<sup>3</sup> (Table 1).

*Forest tree accumulation of provincial forest by age groups*

The average forest tree accumulation per ha of targeted 5 provinces was 108 m<sup>3</sup>, higher than 98 m<sup>3</sup> of the whole country. It was found that Gyeongnam had the highest forest tree accumulation per ha as 121 m<sup>3</sup>, followed by Gyeonggi with 110 m<sup>3</sup>, Gangwon with 104 m<sup>3</sup>, and Chungnam with 101 m<sup>3</sup>. By age groups, while for 5 provinces, the ratio of over 30 year old trees was more than 75%, the average of the whole country was 58%. It was shown that among the targeted provinces, Gyeonggi had the highest ratio of over 30 year old trees as 86%, followed by Gyeongnam with 85%, Chungnam with 71%, Gangwon with 66%, and Jeonbuk with 61% (Table 2).

**Status of administration and management of provincial forest***Revenue and expenditure of provincial forest*

For the revenue and expenditure status of provincial forest of targeted 5 province, it was found that the aver-

**Table 1.** Area and forest tree accumulation of provincial forest

Classification	Forest area of the whole province (10,000 ha)	Area of provincial forest (10,000 ha)	Total forest area of provincial forest /province (%)	Tree accumulation of total province (million m <sup>3</sup> )	Tree accumulation of provincial forest (million m <sup>3</sup> )	Total forest tree accumulation of provincial forest /province (%)
Total	349.4	9.7	2.8	363.1	10.4	2.9
Average	69.9	1.9	2.8	72.6	2.1	2.9
Gyeonggi	52.9	3.1	5.9	45.9	3.4	7.4
Gangwon	136.9	2.9	2.1	168.0	3.0	1.8
Chungnam	44.0	1.0	2.3	39.1	1.0	2.6
Jeonbuk	44.8	1.1	2.5	47.1	1.0	2.1
Gyeongnam	70.8	1.6	2.3	63.1	1.9	3.0

Note: Area and tree accumulation of nationwide forest were 6.38 million ha and 6.24 million m<sup>3</sup>, respectively.

**Table 2.** Forest tree accumulation of provincial forest by age groups(Unit: 10,000 m<sup>3</sup>, %)

Classification	m <sup>3</sup> /ha	Total	II age group	III age group	IV age group	V age group	VI age group
Whole country	98	62,440 (100)	5,712 (9)	20,296 (33)	24,231 (39)	8,899 (14)	3,302 (5)
Total	108	1,044 (100)	38 (4)	214 (21)	484 (46)	262 (25)	46 (4)
Gyeonggi	110	342 (100)	5 (2)	44 (13)	164 (48)	115 (34)	14 (4)
Gangwon	104	302 (100)	26 (9)	77 (25)	134 (44)	45 (15)	20 (7)
Chungnam	101	101 (100)	3 (3)	26 (26)	48 (48)	13 (13)	11 (10)
Jeonbuk	95	105 (100)	2 (2)	39 (37)	50 (48)	14 (13)	-
Gyeongnam	121	194 (100)	2 (1)	28 (14)	88 (45)	75 (39)	1 (1)

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

age revenue of 5 provinces was 373 million won, but the average revenue of 4 provinces excluding 1,500 million won from selling provincial forest of Chungnam was 92 million won. Contents of the revenue consisted of 172 million of forest byproducts, 120 million won of rental income, and 72 million won of collection of province owned forest products.

In addition, for the expenditure it was found that the average expenditure of 5 provinces was 2,838 million won, 7 times more than the revenue, and Gangwon had the greatest estimated expenditure as 5,302 million won, followed by Gyeonggi with 4,855 million won, Gyeongnam with 1,582 million won, and Chungnam with 1,397 million won. Among the major contents of the expenditure, the forest resource growing was the most as 44%, followed by formation and complement project of leisure facilities with 20% and basis establishment of provincial forest with 19%. For reference, the targeted 5 provinces had formed or are forming 1~3 sites of natural leisure facility with their provincial forest and especially Gangwon was operating a hunting site (Gyeonggi-do Forestry Environment Research Institute, 2009; Gangwon-do Forest Development Research Center, 2008; Chungnam Forestry Environment Research Institute, 2009; Jeonbuk Forestry Environment Research Institute, 2009; Gyeongnam Forestry Environment Research Institute, 2009).

### Status of lending and use permission of provincial property

For the number of cases and their contents relating to lending and use permission of national forest (including profit-sharing forest), it was shown that their total number of cases was 11,793 and common, public, and industry purpose took their major part (Forest service, 2008a). For the status of lending and use permission of provincial property in the targeted provinces, it was known that total number of use permission was 713 and average number of each province was 143. For the number of permission by provinces it was found that Chungnam had the largest number as 395, followed by Gyeonggi with 152, Gangwon with 123, Jeonbuk with 36, and Gyeongnam with 5. Their contents of permission had some differences by regions, but residence took the largest part as 32%, followed by farming with 15%, common and public with 6%, and military installation with 5% (Gyeonggi-do Forestry Environment Research Institute, 2008; Gangwon-do Forest Development Research Center, 2008; Chungnam Forestry Environment Research Institute, 2009; Jeonbuk Forestry Environment Research Institute, 2009; Gyeongnam Forestry Environment Research Institute, 2009). By regions, it was found that military installation and steel tower in Gyeonggi, common and public and industry in Gangwon, residence and farming in Chungnam, and collection of forest products and farming in Jeonbuk took relatively larger part, suggesting there were some differences in the contents of

**Table 3.** Revenue and expenditure of provincial forest

(Unit: Million won, %)

Classification	Revenue					Expenditure				
	Total	Property selling of provincial forest	Forest byproducts	Rental income	Collection of province owned forest products	Total	Developing forest resources	Formation and complement of leisure facility	Forming a basis of provincial forest	Others
Total	1,866 (100)	1,500 (80)	172 (9)	120 (6)	72 (4)	14,192 (100)	6,298 (44)	2,831 (20)	2,691 (19)	2,372 (17)
Average	373	300	34	24	14	2,838	1,260	566	538	474
Gyeonggi	113	—	2	73	38	4,855 (100)	1,697 (35)	2,130 (44)	873 (18)	155 (3)
Gangwon	214	—	170	37	5	5,302 (100)	1,478 (28)	524 (10)	1,083 (20)	2,217 (42)
Chungnam	1,500	1,500	—	—	—	1,397 (100)	818 (59)	—	579 (41)	—
Jeonbuk	18	—	—	10	8	1,056 (100)	979 (93)	77 (7)	—	—
Gyeongnam	21	—	—	—	21	1,582 (100)	1,326 (84)	100 (6)	156 (10)	—

Note: 1. Collection of province owned forest products of Gyeonggi includes Gorosoe fluid and pine nuts and forest byproduct is forest tree selling.

2. Forest byproducts in Gangwon's revenue are 140 million won from selling wood materials and 30 million won from young plants.

3. Other in expenditure of Gangwon is construction of training facility.

4. Basis forming project of provincial forest mainly includes projects for forest road and erosion control works and forest resource growing projects include mainly forestation, forest fire prevention, and control of forest pest.

5. Collection of province owned forest products of Gyeongnam is Gorosoe fluid.

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

permission by regions.

First, for the area contents of lending and use permission of national forest, it was found that among total area, 67,190 ha, profit-sharing forest and common and public area took the largest part as 38% and 32% but the permission area accounted for 4.5% of total area of

national forest, 1,509,163 ha. The total permission area (including profit-sharing forest) of the targeted 5 provinces was 3,203 ha, which accounted for 3.3% of total area of provincial forest, 97,000 ha, showing a level slightly lower than that of national forest. In addition when excluding the profit sharing forest of Jeonbuk, the total

**Table 4.** Number of cases for lending and use permission of provincial property

(Unit: No of cases, %)

Classification	Total	Residence	Farming	Common, public	Military installation	Industry	Steel tower	Collection of forest products	Cattle raising	Mining	Leisure	Forestation	Others
National forest	12,139 (100)	–	–	2,348 (19)	–	2,975 (25)	–	–	221 (2)	254 (2)	–	176 (1)	6,165 (51)
Total	713 (100)	227 (32)	109 (15)	42 (6)	39 (5)	23 (3)	19 (3)	18 (3)	7 (1)	4	3	1	222 (31)
Average	143	45	22	8	8	5	4	4	1	–	–	–	44
Gyeonggi	154 (100)	17 (11)	16 (10)	–	30 (19)	–	19 (12)	1	1	–	1	–	69 (45)
Gangwon	123 (100)	6 (5)	20 (16)	42 (34)	9 (7)	23 (19)	–	–	3 (2)	3 (2)	–	1 (1)	17 (14)
Chungnam	395 (100)	204 (52)	67 (17)	–	–	–	–	–	–	–	2 (1)	–	122 (31)
Jeonbuk	36 (100)	–	6 (17)	–	–	–	–	12 (33)	3 (8)	1 (3)	–	–	14 (39)
Gyeongnam	5 (100)	–	–	–	–	–	–	5 (100)	–	–	–	–	–

Note: 1. Others of Gyeonggi refer to automatic rainfall alarming facility, land for installation, public road, and installation of electric poles.

2. Forest products of Jeonbuk include 3 cases of persimmons and 9 cases of Gorosoe fluid.

3. Forest products of Gyeongnam is Gorosoe fluid.

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

**Table 5.** Area for lending and use permission of provincial property

(Unit: ha, %)

Classification	Total	Profit-sharing forest	Leisure	Forestation	Military installation	Farming	Common, public	Cattle raising	Collection of forest products	Residence	Industry	Mining	Steel tower	Others
National forest	67,190 (100)	25,499 (38)	–	6,008 (9)	–	–	21,169 (32)	3,818 (6)	–	–	3,422 (5)	1,188 (2)	–	6,086
Total	3,203 (100)	2,070 (65)	680 (21)	155 (5)	77 (2)	51 (2)	32	21	8	7	6	1	1	94
Average	641	414	136	31	15	10	6	4	2	1	1	–	–	19
Gyeonggi	70 (100)	–	136	–	52 (74)	2	–	1	8 (11)	1	–	–	1	5
Gangwon	290 (100)	–	–	155 (53)	25 (9)	45 (16)	32 (11)	20 (7)	–	1	6	1	–	5
Chungnam	713 (100)	–	–	–	–	4	–	–	358 plants	5	–	–	–	24
Jeonbuk	2,130	2,070 (97)	680 (95)	–	–	–	–	–	–	–	–	–	–	60
Gyeongnam	11,537 plants	–	–	–	–	–	–	–	11,537 plants	–	–	–	–	–

Note: 1. Collection of forest product of Gyeonggi is cultivation of cultivated mountain ginseng.

2. Collection of forest product of Chungnam is Gorosoe fluid, non-paid lending.

3. Profit sharing forest of Jeonbuk is possessed by paper manufacturing company (2,044 ha) and Forestry Association (26 ha).

4. Collection of forest product of Gyeongnam is Gorosoe fluid and 11,537 plants are not included in total.

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

permission area of 5 provinces was 1,133 ha and the average permission area of each province excluding Jeonbuk was 268 ha (Gyeonggi-do Forestry Environment Research Institute, 2008; Gangwon-do Forest Development Research Center, 2008; Chungnam Forestry Environment Research Institute, 2009; Jeonbuk Forestry Environment Research Institute, 2009; Gyeongnam Forestry Environment Research Institute, 2009) It was shown that for the permission area by provinces, Jeonbuk had the largest area as 2,130 ha, followed by Chungnam with 713 ha, Gangwon with 290 ha, and Gyeonggi with 70 ha For the ratio of permission area to total area of each provincial forest, it was found that they were 19% of Jeonbuk, 7% of Chungnam, 1% of Gangwon, 0.2% of Gyeonggi, and none of Gyeongnam (Table 5)

#### *Status of Earning and forest project from provincial property*

First, the earning status using the provincial property

may be largely classified into earning from forest products and earning from lending and use permission Total earning of the targeted 5 provinces was 258.06 million won, the average earning of each province was 51.61 million won, and Gyeonggi had the largest earning as 153.02 million won The earning levels of other 4 provinces were in 18.17~44.15 million won However, the average earning of the 5 provinces from their provincial property was 51.61 million won, which was very low level, accounting for 1.8% of the average annual expenditure of 5 provinces, 2,838 million won Concretely, in case of Gyeonggi, earning from lending and use permission accounted for 74%, followed by earning from pine nuts and Gorosoe fluid In case of Gangwon, the earning from lending and use permission took the almost all, Chungnam had no earning from forest products, Jeonbuk had similar ratio between earning from forest products and lending and use permission, and Gyeongnam had no earning from lending

**Table 6.** Earning from provincial property

(Unit: 10 thousand won)

Classification	Total	Earning from forest products				Earning from lending and use permission								Others
		Gorosoe fluid	Pine nuts	Forest tree selling	Persimmon	Forestation	Residence	Cattle raising	Farming	Leisure	Industry	Building	Mining	
Total	25,806 (100)	4,388 (17)	2,634 (10)	174 (1)	113	2,117 (8)	848 (3)	834 (3)	713 (3)	661 (3)	360 (1)	54	17	12,893 (50)
Average	5,161	878	527	35	23	423	170	167	143	132	72	11	3	2,579
Gyeonggi	15,302 (100)	1,194 (8)	2,634 (17)	174	-	-	-	-	-	-	-	-	-	11,300 (74)
Gangwon	4,415 (100)	482 (11)	-	-	-	2,117 (48)	371 (8)	202 (5)	217 (5)	-	360 (8)	-	14	652 (15)
Chungnam	2,328 (100)	-	-	-	-	-	477 (20)	-	261 (11)	661 (28)	-	-	-	929 (40)
Jeonbuk	1,944 (100)	895 (46)	-	-	113 (6)	-	-	632 (33)	235 (12)	-	-	54	3	12
Gyeongnam	1,817 (100)	1,817 (100)	-	-	-	-	-	-	-	-	-	-	-	-

Note: 1. Other of Gyeonggi is earning from lending and use permission.

2. Other of Gangwon is earning from agricultural product sales booths, convenient facilities and ramps to swimming beach.

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

**Table 7.** Major forest projects of provincial forest

Classification	Forestation (ha)	Forest maintenance (ha)							Forest road (km)			
		Total	Nurturing of natural forest	Improvement of natural forest	Harvest by thinning	Vine elimination	Mowing	Others	Total	Repairing	Structure improvement	New installation
Total	112	5,066	1,934	804	495	284	256	1,293	69	47	17	5
Average	22	1,013	387	161	99	57	51	259	14	9	3	1
Gyeonggi	20	1,000	450	-	150	200	130	70	30	26	3	1
Gangwon	49	1,426	284	688	285	34	56	79	24	10	14	-
Chungnam	45	649	400	116	60	-	-	73	6	4	-	2
Jeonbuk	5	990	800	-	-	50	70	70	-	-	-	-
Gyeongnam	6	1,000	-	-	-	-	-	1,000	9	7	-	2

Note: 1. Others of Gyeonggi refer to nurturing of young trees (70 ha).

2. Others of Gangwon refer to collection of products (73ha) and arrangement in forest (6 ha).

3. Others of Jeonbuk refer to collection of products (70 ha).



and use permission (Gyeonggi-do Forestry Environment Research Institute, 2009; Gyeonggi-do, 2009; Gangwon-do Forest Development Research Center, 2008; Chungnam Forestry Environment Research Institute, 2009; Jeonbuk Forestry Environment Research Institute, 2009; Gyeongnam Forestry Environment Research Institute, 2009) (Table 6) In addition as the earning from forest products is irregular affected by climate and alternate year bearing, Gangwon had no earning from pine nuts and pine mushroom in 2007.

Major forest projects of provincial forest include for-estation, forest maintenance and forest road Among them, the forestation had a business scale of 549 ha, forest main-tenance had a scale of 649~1,426 ha averaged to 1,013 ha, but for the forest road, repair and structure improve-ment took larger part than new installation (Table 7).

### CONCLUSION

1. For the area of provincial forest, it was found that Gyeonggi had the largest area as 31,000 ha, followed by Gangwon with 29,000 ha and Gyeongnam with 16,000 ha Jeonbuk and Chungnam had 11,000 ha of average area respectively For the ratio taken by provincial forest in the whole forest area of the provinces, it was shown that Gyeonggi had the greatest ratio as 5.9% and the ratio of other 4 provinces was 2.1~2.5%.
2. It was found that the average forest tree accumulation per ha of nationwide forest was 98 m<sup>3</sup> and Gyeongnam had the highest forest tree accumulation per ha as 121 m<sup>3</sup>, followed by Gyeonggi with 110 m<sup>3</sup>, Gangwon with 104 m<sup>3</sup>, and Chungnam with 101 m<sup>3</sup>.
3. The average revenue of 4 provinces excluding 1,500 million won from selling provincial forest of Chungnam was 92 million won Contents of the revenue consisted of 172 million of forest byproducts, 120 million won of rental income, and 72 million won of collection of province owned forest products.
4. Gangwon had the greatest estimated expenditure as 5,302 million won, followed by Gyeonggi with 4,855 million won, Gyeongnam with 1,582 million won, and Chungnam with 1,397 million won Among the major contents of the expenditure, the forest resource growing was the most as 44%, followed by formation and complement project of leisure facilities with 20% and basis establishment of provincial forest with 19%.
5. It was shown that their total number of cases relating to lending and use permission of national forest (including profit-sharing forest) was 11,793 and common, public, and industry purpose took their major part The total number of use permission was 713 and its average number of each province was 143 For the contents of permission, it was found that military installation and steel tower in Gyeonggi, common and public and industry in Gangwon, residence and farming in Chungnam, and collection of forest products and farming in Jeonbuk took relatively larger part, suggesting there were some differ-

ences in the contents of permission by regions.

6. Although the area of lending and use permission of national forest accounted for 4.5% of total area of national forest, 1,509,163 ha, it accounted for 3.3% of the total area of provincial forest of the subjected 5 provinces, 97,000 ha.
7. Total earning of the targeted 5 provinces was 258.06 million won, the average earning of each province was 51.61 million won, and Gyeonggi had the largest earning as 153.02 million won The earning levels of other 4 provinces were in 18.17~44.15 million won However, the average earning of the 5 provinces from their provincial property was 51.61 million won, which was very low level, accounting for 1.8% of the average annual expenditure of 5 provinces, 2,838 million won.
8. Major forest projects of provincial forest include for-estation, forest maintenance and forest road Among them, the forestation had a business scale of 5~49 ha, forest maintenance had a scale of 649~1,426 ha averaged to 1,013 ha, but for the forest road, repair and structure improvement took larger part than new installation.

Therefore, it seems that following measures should be sought for healthy fostering and management activation of provincial forest in future.

1. It is considered that although about half of expenditure is currently invested to fostering of forest resources and formation of management basis, it should be managed and operated to be a model of private forest management through continuous investment in future.
2. Considering that status of lending and use permission of provincial forest is lower compared with national forest, it is considered that the lending and use permission of provincial forest to the local residents should be expanded to contribute to increase family income of residents in agricultural and mountain villages as well as activation of local economy and it is considered to be desired that the lending and permission should be expanded gradually from crops in forest causing little damage to the trees and forest In addition, it seems desirable to give a lending and use permission to rural villages or local farming groups rather than individuals to acknowledge contribution of residents who helped to protect provincial forest.
3. Although the management goal of provincial forest may have some differences from other general private forest, it seems also necessary to seek measures to secure the revenue, which is much lower than the estimated expenditure, by actively marketing the thinned wood and by products for expansion of forest commencement Furthermore, it is considered that reviewing measures to invest financial resourced prepared by introduction of systems such as profit sharing contract against provincial residents to forest commencement will be necessary.
4. Finally, in order to suggest developmental measures

for provincial forest of each province concretely it seems that analysis on multilateral aspects such as forest type, long term management goal, and environmental conditions by provincial forests is essential.

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