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Study on Current Status and Task of Sawmills Located in the Woodland of Korea

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In November 2011, the government established the Timber Industry Promotion Plan (2012~2016) with the goal of developing the foundation for timber industry covering the forest management and timber production by expanding the market for timber industry from 24 trillion won up to 35 trillion won to increase the contribution of the timber industry to the timber industry, expanding per capita use of timber from $0.55\,m^3$ up to $0.63\,m^3$ to cope with climate change, and expanding domestic timber supply from 14% to 20%. In order to achieve the goal the government is establishing detailed plans such as the expansion of the stable supply of domestic timber, the improvement of the competitiveness of the timber industry, the promotion of the use of wooden goods, and the development of the basis for promoting timber industry. However, there are many problems such as the intensifying competition in securing raw materials due to the disadvantage in the sustainable use of resources according to the disproportionate distribution of age groups, the low–grade timber with low utilization values, short supply of timber inside Korea, the increase of imported timber price, the pettiness of the timer industry and lack of effort to develop technology, the supremacy of lumberjack over the raw timber price and circulation, limitation in making precise estimation and prediction about the market due to lack of timber related statistical data, unplanned forest tree production, the difficulties in securing stable raw material supply and consumption due to the small distribution of consumers, insufficient national awareness and public relations concerning timber, insufficient use of timber by the people compared to foreign countries, insufficient demand for wooden pellets, the weakening of productivity due to the decrease and aging of manpower in the raw timber production and timber industry, the limitation of productivity due to slow mechanization of forestry, the absolute insufficiency of forest road, and the incompletion of legal system for the promotion of timber industry. On the other hand, there are hardly any empirical case study on the management of sawmills considering regional characteristics. Under the circumstances, this study intended to identify the problems related with the management and seek for the developmental direction of sawmills and the ways to expand domestic timber centering on sawmills located in 3 counties: Jangsu–gun, Jinan–gun, and Muju–gun, which are the typical forest areas inside Jeollabuk–do and are located in the inland area. According to the result, all sawmills surveyed used domestic timber that they were promoting public interest with the forest in the region through silviculture such as lumbering and afforestation and contributing to local economy and job creating by activating forest management.

Key words: sawmills, woodland, timber industry, raw materials, regional characteristics

INTRODUCTION

The government has selected the promotion of environment–friendly wood industry as the key issue and decided to increase the timber self–sufficiency from 10% in 2005 up to 14% and 17% as of 2012 and 2017, respectively, through the 5th Basic Forest Plan (2008~2017) in order to foster resource recycling forest projects and uplift their competitiveness (Korea Forest Service, 2011c). The government also established the Timber Industry Promotion Plan (2012~2016) in November 2011 with the goal of developing the foundation for timber industry covering the forest management and timber production by expanding the market for timber industry from 24 trillion won up to 35 trillion won to increase the contribution of the timber industry to the timber indus-

try, expanding per capita use of timber from $0.55\,m^3$ up to $0.63\,m^3$ to cope with climate change, and expanding domestic timber supply from 14% to 20% (Korea Forest Service, 2011d). In order to achieve the goal the government is establishing detailed plans such as the expansion of the stable supply of domestic timber, the improvement of the competitiveness of the timber industry, the promotion of the use of wooden goods, and the development of the basis for promoting timber industry.

However, in the area of "expanding the stable supply of domestic timber," companies have problems such as the intensifying competition in securing raw materials due to the disadvantage in the sustainable use of resources according to the disproportionate distribution of age groups, the low–grade timber with low utilization values, short supply of timber inside Korea, and the increase of imported timber price. In the area of "improving the competitiveness of the timber industry," there are problems such as the pettiness of the timer industry and lack of effort to develop technology, the supremacy of lumberjack over the raw timber price and circulation, limitation in making precise estimation and prediction about the market due to lack of timber related statistical

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data, unplanned forest tree production, and the difficulties in securing stable raw material supply and consumption due to the small distribution of consumers. In the area of "promoting the use of wooden goods," there are problems such as insufficient national awareness and public relations concerning timber, insufficient use of timber by the people compared to foreign countries, and insufficient demand for wooden pellets, and in the area of "developing the basis for promoting timber industry," there are problems such as the weakening of productivity due to the decrease and aging of manpower in the raw timber production and timber industry, the limitation of productivity due to slow mechanization of forestry, the absolute insufficiency of forest road, and the incompletion of legal system for the promotion of timber industry (Korea Forest Service, 2011d; Korea Forest Service, 2012).

Preceding studies related with sawmills and timber industry include the Study on the Development Direction of Timber Industry (Son, 2002; Kang *et al.*, 2012; Lee, 1997) and Analysis on Environmental Factors Influencing the Supply of Timber (Kim *et al.*, 2006; Shin, 2003), however, there are hardly any empirical case study on the management of sawmills considering regional characteristics. Under the circumstances, this study intended to identify the problems related with the management and seek for the developmental direction of sawmills and the ways to expand domestic timber centering on sawmills located in 3 counties: Jangsu–gun, Jinan–gun, and Muju–gun, which are the typical forest areas inside Jeollabuk–do.

MATERIALS AND METHODS

There were 65 sawmills in Jeollabuk–do in 2008 and 2 more sawmills were added in 2010 that currently there are 67 sawmills. However, the number of sawmills in Korea reduced from 674 in 2008 down to 533 in 2010 that it decreased heavily in most areas excluding some areas. For the study, Jangsu–gun, Jinan–gun, and Muju–gun were selected for they are located in the inland area of Jeollabuk–do and manifested high forest rate. There are 14 cities and counties in Jeollabuk–do, and the forest ratio of of entire Jeollabuk–do is 55%, and that of surveyed areas, Jangsu–gun and Jinan–gun, is 76%, respectively, and that of Muju–gun is 82%. The forest ratio of 11 cities and counties excluding 3 areas surveyed was 21~72% and 41% in average (Korea Forest Service, 2011b).

The survey targeted all sawmills located in Jangsu–gun, Jinan–gun, and Muju–gun, however, the survey was not held in Muju–gun for there were no sawmills in the area. There were 7 sawmills in Jangsu–gun, but 5 of them were included in the survey as 1 of them was new and another one refused to respond to the survey. In Jinan–gun, all 6 sawmills participated in the survey (Korea Forest Service, 2011b).

The survey was held in the form of direct interview for 4 months from the beginning of January to April, 2012 on general status such as the operating period, the age

of owner, and the average number of days worked in a month and difficulties of saw mills such as the purchase volume of raw timber, purchase price, tree species, and operating condition, and data were comparatively analyzed by region.

RESULTS AND DISCUSSIONS

Current Status of Sawmills in Korea
Size of Forest and Growing Stcok

The total forest area of Korea is 6,369,000 ha which is 64% of the entire land area of Korea, and by tree species, 41% of the forest is coniferous, 27% deciduous, and 29% and mixed stand forest. The growing scale is total 800,000,000 m^3, and by tree species, 42% of it is coniferous, 27% deciduous, and 31% and mixed stand, however, the total growing scale per ha was 126 m^3. Considering the forest area and growing scale of major tree species, the coniferous trees accounted for 60% and 61%, respectively, and the pine tree accounted for the largest part of coniferous trees, and its forest area and growing scale were 56% and 62% of the total (Korea Forest Service, 2011b).

Sawmills and Use of Raw Timber

As of 2010, there were 533 ordinary sawmills in Korea, which is 12% less than 609 sawmills in 2008, and the arrival of timber decreased by 16%. In 2010, the average number of employees per sawmill was 9.2, the average salary was 1.76 million won, sales per sawmill was approximately 2.1 billion won. (Korea Forest Service, 2009; Korea Forest Service, 2011a).

According to the use of timber by sawmills as of 2010, the number of sawmills that only use domestic timber increased gradually among 533 sawmills from 14% in 2008 up to 21%, and the ones that handle both domestic timber and imported timber decreased down to 19%, and the ones that only handle imported timber increased gradually up to 60%. By region, 155 sawmills, 29% of all sawmills were located in Incheon and Busan, the port cities, and there were 67 sawmills in Jeollabuk–do where the sawmills surveyed in this study were located (Korea Forest Service, 2011a).

According to the status of raw timber supply, ordinary sawmills used 13% domestic timber and 87% imported timber that they heavily relied on imports and the timber was mostly coniferous rather than non–coniferous (Korea Forest Service, 2011a).

According to the supply of domestic timber (coniferous tree) in each region in 2010, 430,000 m^3 of timber is supplied in total, which is 17% decrease from 2008. By tree species, the larch and pine accounted for 48% and 34%, respectively, however, the supply of larch and pine decreased greatly compared with 2008 while that of rigida and nut pine increased greatly. This appears to be attributed to the fact that the usage of larch and pine is more or less diverse compared with rigida and nut pine, the logging of the stand which reached the final age is progressed to a degree, and the lumbering area decreased accordingly and that the usage of rigida and nut pine

Table 1. Size of Forest and Growing Stock for Major Tree Species

(Unit: 1,000 ha, 100,000 m³)

Division	Total	Coniferous						Non–Coniferous			
		Subtotal	Pine	Larch	Pitch Pine	Korean Pine	Other conifers	Subtotal	Chestnut	Non–Coniferous Plantation	Others Decideous Trees
Area	4,298 (100)	2,581 (60)	1,447	425	387	214	108	1,717 (40)	78	37	1,602
Stock	5,515 (100)	3,363 (61)	2,090	589	446	173	65	2,152 (39)	40	4	2,108

Source: Korea Forest Service. 2011b *statistical yearbook of forestry*
Note: Figures inside ( ) refers to distribution ratio (%)

Table 2. Status of Korean Sawmills

Division	2008	2009	2010
Number of Sawmills	609	561	533
Arrival of Raw Timber	4,152,070 m³	3,617,395 m³	3,482,824 m³
Total Sales	1,295 Billion Won	983.8 Billion Won	1,108.2 Billion Won
Employees	4,446	4,656	4,904
Domestic Timber Utilization Rate	13.5%	15.6%	13.0%
Monthly Average Salary	1,560,000 Won	1,640,000 Won	1,760,000 Won
Average Sales per Sawmill	1.69 Billion Won	1.75 Billion Won	2.08 Billion Won
Employees per Sawmill	7.3	8.3	9.2
Arrival of Raw Timber by Sawmill	6,817 m³	6,448 m³	6,534 m³

Source: Korea Forest Service. 2011a *Research on the Actual Condition of Wood Application in 2010*

Table 3. Status of Timber Used in Sawmills in Each Region (2010)

Division	Number of Companies	Domestic Timber	Imported Timber	Domestic Timber+ Imported Timber
2008	609	14.1	51.1	20.0
2009	561	14.4	57.4	28.2
2010	533	20.9	60.0	19.1
Busan	61	3.3	93.9	2.8
Daegu	5	42.1	57.0	–
Incheon	94	–	96.0	4.0
Gwangju	8	–	77.2	22.8
Daejeon	1	–	100.0	–
Ulsan	3	–	–	100.0
Gyeonggi	60	24.0	53.6	22.4
Gangwon	70	43.0	10.0	47.0
Chungcheongbuk–do	13	45.1	34.2	20.7
Chungcheongnam–do	20	25.0	55.0	20.0
Jeollabuk–do	67	32.7	42.7	24.6
Jeollanam–do	50	27.0	49.5	23.5
Gyeongsangbuk–do	22	9.2	56.5	34.3
Gyeongsangnam–do	52	14.0	80.2	5.8
Jeju	7	100.0	–	–

Source: Korea Forest Service. 2011a *Actual Condition of the Use of Timber in 2010*

Table 4. Status of Raw Timber Supply (as of 2010)

(Unit: 10,000 m³, %)

Division	Domestic + Import			Domestic Raw Timber Supply			Imported Raw Timber Supply		
	Total	Coniferous	Non–Coniferous	Subtotal	Coniferous	Non–Coniferous	Total	Coniferous	Non–Coniferous
Total	703 (100)	531 (100)	172 (100)	338 (100)	186	152	365 (100)	345	20
Plywood	207 (29)	164 (31)	43 (25)	146 (43)	104	42	61 (17)	60	1
Chip Manufacturer	103 (15)	35 (7)	68 (40)	103 (30)	35	68	–	–	–
Ordinary Sawmill	348 (50)	327 (62)	21 (12)	45 (13)	43	2	303 (87)	284	19
Other	45 (6)	5 (1)	40 (23)	44 (13)	4	40	1 (–)	1	–

Source: Korea Forest Service. 2011a *Research on the Actual Condition of Wood Application in 2010*
Note: 1. Other refers to preservative treatment, charcoal/pyroligneous liquor manufacturer, saw dust/wooden flour manufacturer, pyogo mushroom farming.
　　　 2. Figures inside ( ) refers to distribution ratio (%).

Table 5. Supply of Domestic Timber (Coniferous Tree) to Sawmills in Each Region (2010)

(Unit: m³)

Division	Total	Larch	Pine	Pitch Pine	Korean Pine	Japanese Red Cedar	Others
2008	519,032	387,962	84,303	17,898	17,574	7,657	3,638
2009	534,337	224,792	244,363	8,321	36,113	8,719	12,043
2010	431,497	207,281	145,375	33,370	28,407	7,179	9,885
Busan	40	–	–	–	–	–	40
Incheon	4,163	2,618	–	1,545	–	–	–
Gwangju	500	–	500	–	–	–	–
Gyeonggi	23,943	15,707	575	–	7,662	–	–
Gangwon	214,577(50)	111047	81,589	1,396	17,538	–	3,007
Chungcheongbuk–do	10,570	8,954	883	175	558	–	–
Chungcheongnam–do	3,684	3,624	60	–	–	–	–
Jeollabuk–do	86,366(20)	14,206	43,040	27,500	1,400	100	120
Jeollanam–do	47,536	25,084	11,262	2,405	1,000	2,107	5,678
Gyeongsangbuk–do	31,436	25,047	4,849	349	250	–	940
Gyeongsangnam–do	3,176	994	2,182	–	–	–	–
Jeju	5,507	–	435	–	–	4,972	100

Source: Korea Forest Service. 2011a *Research on the Actual Condition of Wood Application in 2010*
Note: Figures inside ( ) refers to distribution ratio (%).

which are mainly used as pulp material is not diverse and the lumbering of these species is increasing to renew species (Korea Forest Service, 2011b).

Case Studies of Sawmills

General status of Sawmills

According to the general status of sawmills, 5 in Jangsu–gun and 6 in Jinan–gun, the operating period of 11 sawmills varied greatly from 2~30. The average operating period was 11 years, but it was 15 years in Jangsu–

gun and 7 years in Jinan–gun that the average operating period of sawmills in Jangsu–gun was at least twice longer than that of Jinan–gun. The average age of the owner was 52, and the number of days worked in a month was 23 days, the average number of employees was 6, and the per capita average salary was 1.71 million won, and average annual sales was approximately 700 million won. However, compared with national average, the average number of employees was approximately 3 people less and average monthly salary was

Table 6. General Status of Sawmills

Division		Management Operating Period (Year)	Age of Owner (Age)	Number of Days Worked (Day / Month)	Employees (Person)	Monthly Average Salary (10,000 won / 1 Person)	Sales (100 Million Won / Year)
Average		11	52	23	6	171	6.9
Jangsu–gun	Average	15	52	21	7	188	11.1
	Sawmill A	10	53	20	7	184	10.0
	Sawmill B	12	41	24	5	170	7.0
	Sawmill C	20	58	15	3	135	3.5
	Sawmill D	30	62	24	6	250	20.0
	Sawmill E	4	48	24	15	200	15
Jinan–gun	Average	7	51	24	5	158	3.5
	Sawmill A	20	70	23	3	92	3.0
	Sawmill B	4	44	24	3	180	8.0
	Sawmill C	5	47	24	6	170	4.0
	Sawmill D	2	40	22	3	155	3.0
	Sawmill E	5	56	24	3	160	1.5
	Sawmill F	6	51	25	11	190	14

Table 7. Status of Raw Timber Purchase by Sawmill and Tree Species (2011)

(Unit: %)

Division		Total		Larch		Pitch Pine		Korean Pine		Pine	
		Purchase Volume (m³)	Purchase Amount (100 Million Won)	Purchase Volume (m³)	Purchase Amount (100 Million Won)	Purchase Volume (m³)	Purchase Amount (100 Million Won)	Purchase Volume (m³)	Purchase Amount (100 Million Won)	Purchase Volume (m³)	Purchase Amount (100 Million Won)
		43,553 (100.0)	52.2 (100.0)	42,840 (98.4)	51.7 (99.0)	358 (0.8)	2,543 (0.5)	247 (0.6)	2,079 (0.4)	108 (0.3)	540 (0.1)
Average		3,959	4.7	3,895	4.7	33	231	22	189	9	49
Jangsu–gun	Subtotal	19,395	24.2	19,260	24.1	135	1,400	–	–	–	–
	Average	3,879	4.8	3,852	4.8	27	280	–	–	–	–
	Sawmill A	2,700	3.5	2,700	3.5	–	–	–	–	–	–
	Sawmill B	2,745	3.2	2,610	3.1	135	1,400	–	–	–	–
	Sawmill C	720	0.9	720	0.9	–	–	–	–	–	–
	Sawmill D	5,130	6.6	5,130	6.6	–	–	–	–	–	–
	Sawmill E	8,100	10.0	8,100	10.0	–	–	–	–	–	–
Jinan–gun	Subtotal	24,158	28.0	23,580	27.6	223	1,143	247	2,079	108	540
	Average	4,026	4.7	3,930	4.6	37	191	41	347	18	90
	Sawmill A	1,800	2.2	1,800	2.2	–	–	–	–	–	–
	Sawmill B	3,600	2.0	3,240	1.8	216	1,080	36	180	108	540
	Sawmill C	4,261	5.5	4,050	5.3	–	–	211	1,899	–	–
	Sawmill D	547	0.7	540	0.7	7	63	–	–	–	–
	Sawmill E	450	0.6	450	0.6	–	–	–	–	–	–
	Sawmill F	13,500	17.0	13,500	17.0	–	–	–	–	–	–

Note: Figures inside ( ) refers to distribution ratio (%).

approximately 29% less (Korea Forest Service, 2011a).

Raw Timber Purchase, Production, and Sales Status

On the other hand, 11 sawmills handled only domestic timer, and 10 sawmills purchased raw timber through timber dealers and 1 sawmill, through the timer dealer or by itself. The average purchase volume for raw timber by 11 sawmills is approximately 4,000 m^3, and this accounts for 60% of the national average, 6,500 m^3 (Korea Forest Service, 2011a). The most purchased specie was larch followed by rigida, nut pine, and pine in respective order, however, the larch accounted for 99%

Table 8. Status of Production by Sawmills and Tree Species (2011)

(Unit: %)

Division		Larch	Pitch Pine	Korean Pine	Pine
Jangsu–gun	Sawmill A	Pillar for Ginseng Farm (100)	–	–	–
	Sawmill B	Pillar for Landscaping Trees (50) Palette (50)	Palette (100)	–	–
	Sawmill C	Pillar for Ginseng Farm (100)	–	–	–
	Sawmill D	Half–Finished Pillar for Landscaping Trees (100)	–	–	–
	Sawmill E	Packing Material for Exported Machines (100)	–	–	–
Jinan–gun	Sawmill A	Palette (95) Pillar for Ginseng Farm (5)	–	–	–
	Sawmill B	Pillar for Ginseng Farm (90) Pillar for Abalone Farm (10)	Pillar for Abalone Farm (100)	Pillar for Abalone Farm (100)	Pillar for Abalone Farm (100)
	Sawmill C	Half–Finished Palette (70) Palette (20) Mold for Construction (10)	–	Palette (Auxiliary Material) (100)	–
	Sawmill D	Palette (100)	Palette (Auxiliary Material) (100)	–	–
	Sawmill E	Pillar for Ginseng Farm (50) Half–Finished Palette (50)	–	–	–
	Sawmill F	Half–Finished Palette (100)	–	–	–

Table 9. Raw Timber Producing Ground and Product Sales Status of Sawmills (2011)

(Unit: %)

Division	Sawmill	Raw Timber Producing Ground		Areas the Products are Sold									
				Pillar for Ginseng Farm		Palette		Pillar for Landscaping Trees		Packing Material for Machines for Export		Pillar for Abalone Farm	Mold for Construction
		Total	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Outside	Inside
	Average	100	89	11	69	31	19	81	50	50	50	50	100	100
Jangsu–gun	Average	100	84	16	55	45	–	100	100	100	50	50	–	–
	Sawmill A	100	50	50	10	90	–	–	–	–	–	–	–	–
	Sawmill B	100	100	–	–	–	–	100	100	–	–	–	–	–
	Sawmill C	100	100	–	100	–	–	–	–	–	–	–	–	–
	Sawmill D	100	100	–	–	–	–	–	–	100	–	–	–	–
	Sawmill E	100	70	30	–	–	–	–	–	–	50	50	–	–
Jinan–gun	Average	100	93	7	83	17	38	62	–	–	–	–	100	100
	Sawmill A	100	100	–	80	20	50	50	–	–	–	–	–	–
	Sawmill B	100	90	10	80	20	–	–	–	–	–	–	100	–
	Sawmill C	100	100	–	–	–	10	90	–	–	–	–	–	100
	Sawmill D	100	85	15	–	–	–	100	–	–	–	–	–	–
	Sawmill E	100	100	–	90	10	100	–	–	–	–	–	–	–
	Sawmill F	100	80	20	–	–	30	70	–	–	–	–	–	–

Note: Figures inside ( ) refers to distribution ratio (%).

Table 10. Logging Residue Sales Status (2011)

(Unit: %)

Division		Total (a+b)		Side–Splits (a)		Saw Dust (b)		
		Income (10,000 won)	Quantity (ton)	Income (10,000 won)	Usage	Quantity (m³)	Income (10,000 won)	Usage
		37,224 (100.0)	1,935	9,972 (26.8)	–	16,000	27,252 (73.2)	–
Average		3,384	176	907	–	1,455	2,477	–
Jangsu–gun	Subtotal	28,420 (100.0)	795	4,740 (16.7)	–	14,540	23,680 (83.3)	–
	Average	5,684	159	948	–	2,908	4,736	–
	Sawmill A	90	45	90	Cattle Shed Flooring	–	–	–
	Sawmill B	4,830	450	3,150	Fuel	840	1,680	Cattle Shed Flooring
	Sawmill C	1,500	300	1,500	Manufacturing Wrapping	–	–	–
	Sawmill D	10,000	–	–	–	3,700	10,000	Cattle Shed Flooring
	Sawmill E	12,000	–	–	–	10,000	12,000	Cattle Shed Flooring

and 98% of the timber purchased by sawmills in both areas, respectively. According to respondents, the reason larch is used predominantly over rigida and nut pine is that it is highly demanded for it contains less resin, is light, and is durable. The purchase price of raw timber was 120,000 won for each m³ of larch, 80,000 won for nut pine, 70,000 won for rigida, 50,000 won for pine that the larch was most expensive (Table 7).

On the other hand, sawmills surveyed mostly produced wood pillars for ginseng and landscaping plants and palettes regardless of the species (Table 8).

Considering the producing ground for the raw timber purchased by sawmills, both areas procured 80% of the raw timber within the province of Jeollabuk–do. Sawmills surveyed mostly produced wood pillars for ginseng and landscaping plants and palettes regardless of the species. However, domestic timber is mostly used as structural material for construction and temporary construction materials (40% and 23%, respectively) and only 9% of it is used to make palettes and 2%, agricultural tools (Korea Forest Service, 2011a). Considering the sales of products manufactured by the sawmills surveyed, 69% of the pillars for ginseng farm were sold inside the province, 81% of the palettes were sold outside, and 50% of pillars for landscaping plants were sold inside. The reason most pillars for ginseng farm were sold inside is that there are many ginseng farms in Jangsu–gun and Jinan–gun (Table 9).

On the other hand, lumbering produces logging residues up to 8~30% of the raw timber. The logging residues are disposed by selling and Jangsu–gun and Jinan–gun sold 159 t and 190 t of side–splits, respectively, and earned 9.48 million won and 8.72 million won, respectively. The side–splits were sold for 20,000~70,000 won per ton, 50,000 won in average, and they were mostly

used for manufacturing plywood or as fuel for heating. Jangsu–gun and Jinan–gun sold 3,000 m³ and 243 m³ of sawdust, respectively, and earned 47.36 million won and 5.95 million won, respectively. The saw dust was sold for 12,000~27,000 won per m³, 17,000 won in average, and it was mainly used as the flooring for cattle shed or as organic fertilizer (Table 10).

Management Conditions and Difficulties of Sawmills

Jangsu–gun entirely relied on domestic product for the purchase of raw timber and 16% of the raw timber they purchased were supplied from outside the province. Jinan–gun also entirely relied on domestic product for the purchase of raw timber and 7% of the raw timber they purchased were supplied from outside the province. For management difficulties such as the difficulty in securing raw timber and finding manpower, the increase of raw timber price and transportation cost, the lumberjack requesting for advance payment for the raw timber, lack of facilities, and lack of substitute species, most sawmills in both regions considered maintaining current scale or closing rather than expansion. Some sawmills showed interest in manufacturing products using external materials, but most of them responded that they need state support such as reduction or exemption of tax or the loan on low interest rate as the need for the supplementation of facilities and the replacement cost and the increase of the cost of transporting raw timber are burdening sawmills that usually have weak capital strength.

CONCLUSION

1. As of 2010, there were 533 sawmills in Korea, and 9.2 people were hired by each sawmill in average, aver-

age monthly salary was 1,760,000 won, and the annual sales per sawmill was approximately 2.1 billion won.

2. Considering the supply of raw timber supplied to ordinary sawmills, domestic timber accounted for 13% and the imported, 87%, and the specie was mostly coniferous tree.

3. 430,000 m³ of domestic timber (coniferous tree) was supplied and they were mostly larch and pine, 48% and 34%, respectively.

4. Considering all 11 sawmills surveyed, the average operating period was 11 years, the average age of the owner was 52, the monthly average number of working days was 23 days, the number of employees was 6, the average salary per employee was 1,710,000 won, and annual sales was approximately 700 million won.

5. All 11 sawmills handled domestic timber and in average the sawmills purchased approximately 4,000 m³ and 98% of it was larch.

6. Considering the purchase of raw timber, the larch was purchased at 120,000 won per m³, the nut pine at 80,000 won, the rigida at 70,000 won, and the pine at 50,000 won, in respective order, that the price of the larch was most expensive.

7. Sawmills surveyed mostly produced wood pillars for ginseng and landscaping plants and palettes regardless of the species.

8. Sawmills surveyed sold side–splits for 20,000~70,000 won, 50,000 won in average, and they were mostly used for manufacturing plywood and as fuel for heating. Saw dust was sold for 12,000~27,000 won per m³, 17,000 won in average, and they were mostly used as the cattle shed flooring material and organic fertilizer.

9. All sawmills that were surveyed relied on domestically produced raw timber, and 89% of the raw timber they used were supplied within the region.

10. For management difficulties such as the difficulty in securing raw timber and finding manpower, the increase of raw timber price and transportation cost, the lumberjack requesting for advance payment for the raw timber, lack of facilities, and lack of substitute species, most sawmills considered maintaining current scale or closing rather than expansion.

Therefore, the following measure shall be established in order to foster sawmills in the inland region.

1. Unlike sawmills located in large cities or ports, the sawmills located in the inland region only use domestic raw timber, not only promoting public interest with the forest in the region through silviculture such as lumbering and afforestation but also contributing to local economy and job creation by activating forest management that they need extensive state support.

2. In order to secure the smooth supply of domestically produced raw timber, species that can substitute larch must be developed urgently, and the species that are not used diversely such as rigida and nut pine need to be replaced with useful species.

3. The revitalization of the sawmills within the region requires the manufacture of products essential for the agriculture or industry in the region. For this, it is necessary to secure stable supply of a variety of tree species through systematic afforestation plan.

4. Lastly, the stable supply of raw timber to sawmills within the region also requires the administrative support of the local government in order to prevent the leakage of raw timber produced within the region to other regions.

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