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Study on Trends and Characteristics of Timber Supply and Demand in Korea

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Timber consumption in Korea reached around 27 million m^3 a year while the self–sufficiency rate for timber is only 16.2%. Although the rate has been increasing gradually due to recent afforestation projects and renewal of tree species that increased the production of domestic timber, domestically produced timber is mostly small–diameter logs and Korea still depends on imports for large–diameter logs. For the import of log, New Zealand which represents Radiatapine species accounts for as much as 68% (as of 2013) of the total log import. Contrary to the recent decrease of log imports, the import of timber products such as sawn timber has increased continuously; however, log is still major import item as the sawn timber accounts for 30% of log and sawn timber imports. On the other hand, PB and MDF are showing strong competitive relationship with plywood in Korea. From the 2000's, the domestic production and market scale of PB and MDF are expanding due to the increasing use of timber as interior materials following the demand for qualitative enhancement of residential environment along with the economic development. Especially, MDF accounts for 57% of timber board (plywood , PB, MDF) production.

Key words: timber supply and demand, log, sawn timber, plywood, PB, MDF

INTRODUCTION

Timber is a natural resource used for various purposes from processing of wood products to non–timber use such as the use as an element of public property and is quite closely related with living. Since timber is used as the raw material for plywood, sawn wood, particle board (PB), and so forth after lumbering, timber supply and demand relation has a great impact on overall wood industry. Also, Forest before lumbering plays various roles such as the storage of water resources, recreation and health, and preservation of biodiversity. In other words, it is quite important to understand the characteristics and trends of timber supply and demand as timber, which is closely related with living and wood industry, and its significance has been gradually increasing (Lee *et al*., 2008; Lee *et al*., 2013).

Korea is a net timber importer and heavily depends on imported timber for its self–sufficiency for timber remains below 20% of log production although more than 64% of the total land area of Korea is forest. This is because the afforestation to secure resources began in the late 1960's after the forest resources were devastated by the Korean War and the plywood industry which was the central industry of domestic timber industry before the 1980's had imported a large amount of hardwood tree logs to manufacture and export plywood (Choi *et al*., 2001).

However, timber supply and demand structure in Korea underwent a great change in the 1980's when the forest resource in Southeast Asian countries began to develop their down forest industry and reduced lumbering and to protect environment and began to put an embargo on log export (Korea Forest Research Institute, 2007). This rapidly reduced the import of tropical hardwood log and deteriorated domestic plywood industry's competitive strength in the overseas market which rapidly increased the import of plywood. It also brought great changes to the timber import structure such as the increase of New Zealand's conifer logs in the 1990's. Domestically, the financial crisis at the end of 1997 deteriorated Korean economy and greatly influenced the timber supply and demand (Choi *et al*., 2001). The recession in the construction business from the end of the 1990's and the increase of wood products also brought great changes to timber supply and demand structure in Kore (Min *et al*., 2011).

As described above, changes in external circumstances as well as domestic economic conditions have greatly influenced the timber supply and demand structure. In Korea, timber supply and demand was mostly studied around the 2000's and recently only few studies were performed on the timber supply and demand structure (Jeong *et al*., 1997; Joo *et al*., 1998; Joo, 2004).

Therefore, this study intended to analyze the trend and characteristics of timber supply and demand in Korea by focusing on timber production, import, and export regarding.

MATERIALS AND METHODS

Time series statistical data and investigation reports such as the Forestry Statistics Year Book by Korea Forest Service, forest product import and export statistics, and timber use survey and various publically announced statistical data such as the trade statistics and plywood and

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board statistics of Korea Wood Panel Association were mainly used to analyze the trend and characteristics of timber supply and demand in Korea.

For the trend and characteristics of timber supply and demand, the timber was divided into the category of log which is the raw material for wood product and the category of wood product to analyze the production, import, and export of each product. For wood product, the analysis focused on sawn wood, plywood, PB, MDF, and other products (paper, paperboard, and pulp). To help the understanding of readers, this study briefly examined the timber supply and demand trend including self–sufficiency for timber first and probed into the supply and demand relation of each wood product later.

RESULTS AND DISCUSSIONS

Overview of Timber Supply and Demand

Timber supply and demand in Korea increased heavily from 13.73 million m^3 in 1980 up to 21.74 million m^3 in 1990, and 27.4 million m^3 in 1996. However, due to the financial crisis that started at the end of 1997, the figure temporarily went down to 26.45 million m^3 in 1997 and 20.08 million m^3 in 1998 and bounced back with the economic recovery and recorded the highest figure of 29.04 million m^3 in 2002. Later, the timber supply and demand has been remaining around 27 million m^3 (Table 1).

The examination of timber supply by domestic and imported timber showed that only 4.5 million m^3 was supplied domestically and imports took absolutely large share. Supply of domestic timber remained around 1.1 million m^3 as of 1997, however, increased gradually and reached up to 2.03 million m^3 in 2004 and 4.5 million m^3 in 2012. The ratio of domestic timber (self–sufficiency rate) in total supply was only 4~5% before 1998, however, increased with the increase of domestic timber supply up to 5.7% in 2000, 8.8% in 2005, 13.5% in 2010, and 16.2% in 2012, the highest figure in history. Although the self–sufficiency rate increased with the increase of domestic timber production due to the effort to develop forest resources, most of the supply is composed of small–diameter logs and the industrial usage is low (Korea Forest Service, 2013a).

The imports recorded 20.6 million m^3 in 1990 24.27 million m^3 in 1995, and 27.44 million m^3 in 2002 which was the highest in history. Later, the imports decreased along with the decrease of import logs down to 23.89 million m^3 in 2010 and 23.31 million m^3 in 2012. When divided into log and wood product, the log accounted for 40% and wood product, 60% in 1990, respectively. The ratio of wood product increased gradually later and reached 74% in 2000 and 80% as of 2010. As of 2012, Log accounts for 16% of imports and wood products, 84%.

Meanwhile, the log demand of domestic wood industry gradually decreased from 1991 when it reached the peak, 10.14 million, and recorded 8.32 million m^3 in 2000, 7.94 million m^3 in 2010, and 8.19 million m^3 in 2012. This is attributed to the timber supply structure switching to

Table 1. Trends of Timber Supply and Demand

(Unit: 1,000 m^3)

Year	Total	Log			(Waste Timber)	Timber Product Import	Self–Sufficiency Rate (%)
		Total	Domestic	Import			
1990	21,746	9,423	1,138	8,285	(640)	12,323	5.2
1995	25,325	9,284	1,055	8,229	(1,454)	16,041	4.2
1996	27,404	9,225	1,195	8,030	(1,602)	18,179	4.4
1997	26,452	9,328	1,062	8,266	(1,723)	17,124	4.0
1998	20,081	5,798	1,428	4,370	(1,185)	14,283	7.1
1999	27,816	8,317	1,694	6,623	(1,582)	19,499	6.0
2000	27,970	8,327	1,592	6,735	(1,816)	19,643	5.7
2001	26,243	8,836	1,533	7,303	(1,905)	17,407	5.9
2002	29,047	9,312	1,605	7,707	(1,873)	19,735	5.5
2003	27,389	8,727	1,740	6,987	(2,275)	18,662	6.4
2004	27,211	8,619	2,037	6,582	(2,220)	18,592	7.5
2005	26,719	8,372	2,350	6,022	(2,258)	18,347	8.8
2006	26,623	8,809	2,444	6,365	(2,347)	17,814	9.2
2007	27,347	9,013	2,680	6,333	(2,699)	18,334	9.8
2008	26,752	7,969	2,702	5,267	(2,700)	18,783	10.1
2009	26,607	8,190	3,176	5,014	(2,181)	18,417	11.9
2010	27,612	7,942	3,715	4,227	(2,228)	19,670	13.5
2011	27,608	8,240	4,210	4,030	(2,198)	19,368	15.2
2012	27,819	8,192	4,506	3,686	(2,131)	19,627	16.2

Note: ( ) is not included in the total
Source: Korea Forest Service. 2013 *Statistical Yearbook of Forestry*

the importation of wood products.

The examination of the log demand by usage showed that the pulp wood accounted for the larges share, 49.2%, of the total demand, 8.19 million m^3 as of 2012 followed by general wood including sawn wood (45.7%), plywood (4.9%), and mine timber (0.2%). The one that accounted for the largest ratio of the log demand in the 1970's and at the beginning of the 1980's was plywood. However, domestic plywood industry rapidly lost competitiveness along with the increase of plywood import, and the log demand for plywood decreased down to 1.84 million m^3 and accounted for 19.6% of total demand in 1990, 1.29 million m^3 and 12.8% in 2000, and the lowest 390,000 m^3 and 4.9% in 2010, quickly losing its importance in the wood industry (Table 2).

The log demand for general wood was 6.28 million m^3 in 1990, however, greatly decreased down to 3.30 million m^3 in 1998 due to the financial crisis that started at the end of 1997. Later, the demand gradually increased due to economic recovery and reached 5.42 million m^3 in 2000 and 7.36 million m^3 in 2002, the highest figure in history. However, the demand has been decreasing due to the recess in domestic construction business from the late 2000's.

Pulp wood had only accounted for 5% of log supply and demand (500,000 m^3) until 1990; however, the share increased up to 15.6% (1.29 million m^3) as of 2000, and this level was maintained until the late 2000's. The demand for pulp wood increased further in 2010 and the rate reached up to 45.3% (3.74 million m^3) as of 2011 and up to 49.2% (4.02 million m^3) as of 2012, the highest rate in history.

The consumption of mine timber increased until the late 1980's along with the increase of coal production. However, the increase of alternative energy such as petroleum and LPG after the 1980's and the coal industry rationalization measures by the government rapidly decreased the number of mines and the consumption of mine timber quickly decreased down to 510,000 m^3 as of 1990, 110,000 m^3 as of 2000, and 20,000 m^3 as of 2012 (Korea Forest Research Institute, 2007).

Trends and Characteristics of Supply and Demand of Log

Production

Domestic log production was roughly 1.1 million m^3 around 1990. However, it increased gradually from the late 1990's and remained around 1.7 million m^3 until 2003. Later, the afforestation project to expand forest sink as a countermeasure for global warming was implemented in full, and log production increased from 2.03 million m^3 in 2004 up to 3.71 million m^3 in 2010 and 4.51 million m^3 in 2012 (four–fold increase compared with 1990), which was the highest figure in history (Korea Forest Service, 2013b).

By usage, the log production for general materials including sawn wood accounted for the largest share (3.45 million m^3) among 4.50 million m^3 as of 2012 followed by that for pulp (1.03 million m^3) and that for mine timber (20,000 m^3). Especially, the general materials

Table 2. Trends of Log Supply and Demand

(Unit: 1,000 m^3)

Year	Total	For Domestic Consumption					For Export		
		Total	Mine Timber	Pulp	Plywood	Sawn Wood	Total	Plywood	Sawn Wood
1990	9,423	9,121	512	479	1,849	6,281	302	40	262
1995	9,284	8,939	139	1,275	1,300	6,225	345	186	159
1996	9,225	8,893	109	1,287	1,334	6,163	332	159	173
1997	9,328	8,987	104	1,253	1,611	6,019	341	79	262
1998	5,798	5,265	110	992	859	3,304	533	262	271
1999	8,317	7,836	117	1,361	1,051	5,307	481	233	248
2000	8,327	7,897	112	1,295	1,066	5,424	430	179	251
2001	8,836	8,665	140	1,036	504	6,985	171	109	62
2002	9,312	9,207	58	1,145	638	7,366	105	63	42
2003	8,727	8,622	63	1,216	758	6,585	105	67	38
2004	8,619	8,473	62	1,424	597	6,390	146	75	71
2005	8,372	8,313	55	1,546	549	6,163	59	18	41
2006	8,809	8,740	47	1,437	1,106	6,150	69	23	46
2007	9,013	9,013	45	1,643	1,110	6,215	–	–	–
2008	7,969	7,969	45	1,757	618	5,549	–	–	–
2009	8,190	8,290	39	1,919	500	5,732	–	–	–
2010	7,942	7,942	29	2,549	393	4,971	–	–	–
2011	8,240	8,240	32	3,734	450	4,024	–	–	–
2012	8,192	8,192	18	4,028	406	3,740	–	–	–

Source: Korea Forest Service. 2013 *Statistical Yearbook of Forestry*

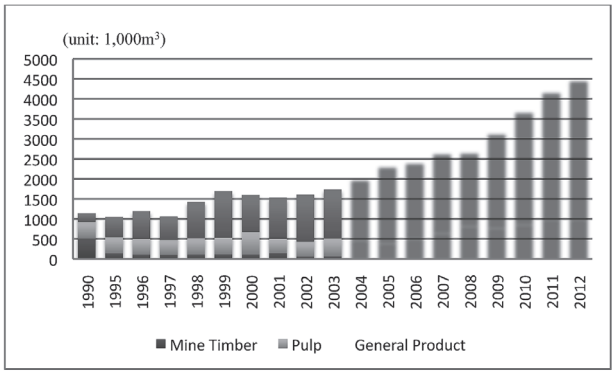

Fig. 1. Trends of Log Production.
Source: Korea Forest Service. 2013 *Statistical Yearbook of Forestry*

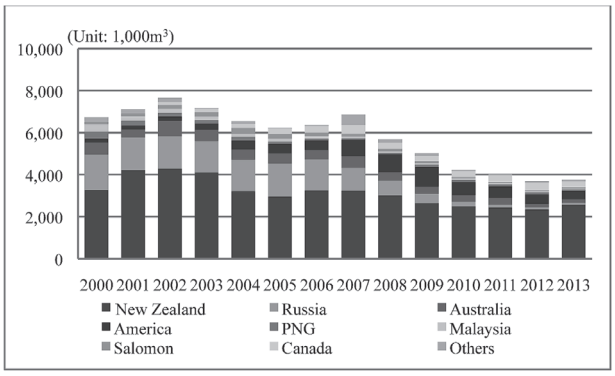

Fig. 2. Trends of Log Import.
Source: Korea Forest Service. 2013 *Forest Product Import/Export Statistics*

drastically increased up to 220,000 m³ in 1990 centering on conifer, 930,000 m³ in 2000, 27.94 million m³ in 2010, and 3.46 million m³ in 2012 (16–fold increase compared with 1990), which was the highest figure in history (Figue 1).

The permissions issued for domestic timber lumbering showed that the lumbering increased from 229million m³ in 2008 up to 867million m³ in 2010 and 1,070 million m³ in 2012. This is attributed to the increase of the final cutting of domestic forest resources which are becoming rich, thinning by afforestation project, lumbering based on the conversion from a mountainous district, species renewal, and lumbering of damaged trees. The lumbering as of 2012 recorded 1,070 million m³, and the thinning accounted for 710 million m³ followed by final cutting (118 million m³), species renewal (102million m³), and damaged trees (360,000 m³), respectively (Table 3).

Import

Log imports continued to decrease from 6.73 million m³ in 2000 down to 6.22 million m³ in 2005, and 4.22 million m³ in 2010, and recorded the lowest figure of 3.68 million m³ in 2012 (33% lower than 2000). By country, the import of New Zealand (2.56 million m³)accounted for the largest share of total log import in 2013 followed by America (0.39 million m³), Canada (0.28 million m³), Australia (0.17 million m³), Russia (0.09 million m³), and PNG (0.08 million m³), respectively.

New Zealand holds an important status for the import of log in Korea. However, the import decreased from the 2000's from 3.23 million m³ in 2007 and drastically down to 2.34 million m³ in 2012. The import from Russia also decreased from 1.68 million m³ in 2000 down to 0.70 million m³ in 2008, and 0.10 million m³ in 2012. Contrary to the decrease of log import from New Zealand and Russia, the import from America, Canada, and Australia has steadily increased from the early 2000's although the quantity is small. The import from Japan also increased greatly from 1,000 m³ in 2000 up to 7,000 m³ in 2007, and 43,000 m³ in 2013 (Figue 2).

On the other hand, the examination of log imports by their species showed that the import of New Zealand's Radiatapine which is used as temporary construction materials and low–end goods as of 2010 took the absolutely large share (2,100.7 million tons) of imports followed by North American Hemlock (427.8 million tons) and Douglas fir (114.0 million tons), and Russian Spruce (0.94 million tons) and Larch (88.6 million tons). Particularly, Russian Larch showed rapid decrease from 661.6 million tons in 2007 down to 163.7 million tons in 2010, and 88.6 million tons in 2012 (7.5 fold decrease from 2007). Spruce decreased sharply from 356.3 million tons in 2007 down to 102.4 million tons in 2010 and 94.6 million tons in 2012. North American Douglas fir showed consistent decrease for overall species while the import maintains similar trend as the past without much changes (Table 4).

A variety of species of hardwood are imported from around the world. Regarding species that have been imported as of 2012, Meranti accounts for the largest

Table 3. Volume of Permissions Issued for Lumbering of Domestic

(Unit: 1,000 m³)

Year	Total	Final Cutting	Thinning	Species Renewal	Damaged Tree	Other
2008	2,288	795	740	522	36	195
2009	3,720	1,027	1,143	687	84	579
2010	8,671	1,136	5,858	736	453	488
2011	9,953	1,272	6,863	871	322	625
2012	10,700	1,183	7,100	1,022	356	1,039

Source: Korea Forest Service. 2013 *Statistical Yearbook of Forestry*

Table 4. Trends of Conifer Log Import by Species

(Unit: 1,000 m^3)

Year	Cedar	Douglas fir	Hemlock	Redpine	Larch	Spruce	Radiatapine
2007	22,000	114,867	701,723	115,010	661,676	356,344	3,184,330
2008	33,737	142,255	623,386	51,996	455,050	284,787	2,845,967
2009	25,696	179,574	708,440	15,253	352,945	171,721	2,465,411
2010	15,802	148,229	514,552	4,605	163,798	102,402	2,338,746
2011	12,923	137,790	466,881	9,147	84,869	102,951	2,327,590
2012	11,881	114,047	427,850	6,104	88,698	94,657	2,100,788

Source: Korea Foreign Trade Association. 2013 *Trade Statistics, Import/Export by Item (HSK 440300000)*

portion (5.33 million tons) followed by Oak (4.14 million tons), Keruing (3.73 million tons), Maple (2.75 million tons), Ash (2.62 million tons), and Walnut (1.60 million tons), respectively. Particularly, the import of Meranti decreased from 12.72 million tons in 2007 down to 1.60 million tons in 2012, and Beech also decreased from 1.05 million tons in 2007 down to 0.40 million tons in 2012. Keruing, Oak, and so forth showed minor increase (Table 5).

Trends and Characteristics of Sawn Wood Supply and Demand

Sawn wood is produced by using conifer and hardwood. In Korea, the conifer sawn wood is mostly used as construction materials and hardwood sawn wood, as the material for manufacturing furniture, floor covering, wood craft, cabinet, storage box, pallet, and container and also various industrial materials. The demand for hardwood sawn wood is small while mostly conifer sawn wood is used.

In Korea, the statistics about sawn wood had been included in the Forest Statistics Year Book published by Korea Forest Service until 1996. However, nationwide survey on sawmill industry had not been conducted after 1996 and the time series statistical data on sawn wood production are not developed. Later, Korea Forest Service has conducted Survey on Timber Use regarding sawmill industries of Korea from 2007 and provided the statistics on the production of sawn wood and sawmill industry (Korea Forest Service, 2012).

According to 2011 Survey on Timber Use conducted by the Korea Forest Service in 2012, the production of sawn wood decreased sharply from 3.01 million m^3 in down to 2.02 million m^3 in 2010, and 1.91 million m^3 in 2011 (1.6 fold decrease from 2008). By raw materials or by domestic log product and imported log product, the production of sawn wood, 0.24 million m^3 of the total production as of 2011 (1.91 million m^3) was the domestic log and 1.66 million m^3, the imported log; the production of sawn wood depended heavily on imports (Table 6).

The timber supply and demand structure in Korea depends on imports for most of wood supply and the imports accounts for an absolutely large portion of timber supply. For this, very few amount of sawn wood is exported and the supply of timber mostly depends on imports. The import of sawn wood has increased consistently contrary to the decrease of log import. The import of sawn wood showed great increase from 739,000 m^3 in

Table 5. Trends of Hardwood Log Import by Species

(Unit: 1,000 m^3)

Year	Meranti	Teak	Keruing	Jerutong	Okoume	Mahogany	Oak	Beech
2007	12,727	247	3,070	1,021	1,131	1,991	3,992	1,058
2008	5,413	261	25,36	1,081	1,104	29	5,911	627
2009	3,363	268	3,955	970	1,056	348	3,001	656
2010	3,435	300	3,086	890	262	654	4,367	253
2011	8,384	328	3,056	576	472	1,758	3,835	399
2012	5,333	87	3,733	575	519	1,005	4,140	405

Year	Rosewood	Ebony	Ash	Walnut	Poplar	Maple	Birch	Basswood
2007	0	54	4,234	5,709	3,477	4,622	123	300
2008	18	47	2,776	3,903	2,715	3,370	205	147
2009	27	51	2,237	4,088	8,391	3,888	282	1
2010	1	27	3,905	3,036	454	3,947	787	211
2011	68	21	2,481	1,852	701	2,773	128	172
2012	29	–	2,622	1,600	1,316	2,754	183	47

Source: Korea Foreign Trade Association. 2013 *Trade Statistics, Import/Export by Item (HSK 440300000)*

Table 6. Trends of Sawn Wood Production

(Unit: m^3)

Year	Total	Domestic Log Product	Imported Log Product
2008	3,013,545	450,744	2,562,801
2009	2,399,720	273,065	2,126,655
2010	2,023,525	268,233	1,710,776
2011	1,916,689	242,362	1,674,325

Source: Korea Forest Service. 2013 *Survey on Timber Use*

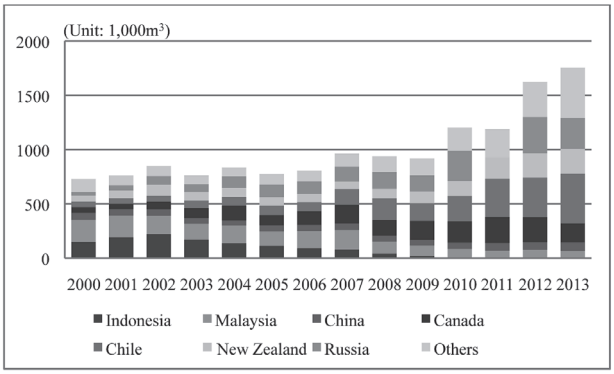

Fig. 3. Trends of Sawn Timber Import.
Source: Korea Forest Service. 2013 *Forest Product Import/Export Statistics*

2000 up to 806,000 m^3 in 2006, and 1,756,000 m^3 in 2013 (2.4 fold increase compared with 2000).

By country, the largest quantity of sawn wood was imported from Chile as of 2013, 458,000 m^3 out of the total 1,756,000 m^3, followed by Russia (285,000 m^3), Canada (174,000 m^3), New Zealand (227,000 m^3), and Malaysia (63,000 m^3). From the 2000's, the imports from Southeast Asian countries such as Indonesia and Malaysia decreased continuously while the imports from Canada, Chile, New Zealand, and Russia that are used for construction are increasing noticeably. Particularly, the increase of imports from Russia and Chile is conspicuous. The import from Russia increased greatly from 34,000 m^3 in 2000 up to 277,000 m^3 in 2010, and 335,000 m^3 in 2012 (9.8 fold increase compared with 2000). The import from Chile also increased greatly from 52,000 m^3 in 2000 up to 230,000 m^3 in 2010, and 364,000 m^3 2012 (7–fold increase compared with 2000) (Figue 3).

Trends and Characteristics of Timber Board Supply and Demand

Production

Korean plywood lost its competitive strength in the overseas market after Southeast Asian countries including Indonesia and Malaysia limited log export to protect their forest resources from the late 1980's and began to promote plywood industry and expand export, resulting in the decrease of domestic production. Plywood production decreased from 1,124,000 m^3 in 1990 down to 747,000 m^3 in 2000, 450,000 m^3 in 2010, and 435,000 m^3

Table 7. Trends of Timber Board Production

(Unit: m^3)

Year	Plywood		PB		MDF	
	Production	Domestic Supply	Production	Domestic Supply	Production	Domestic Supply
1990	1,123,625	1,011,179	165,103	165,103	113,163	113,163
1995	974,237	974,237	548,195	547,180	590,087	542,904
1996	895,979	895,979	659,417	641,396	719,741	630,730
1997	1,014,054	1,014,054	720,735	747,793	728,184	688,690
1998	640,967	640,967	507,157	505,543	570,613	506,541
1999	733,680	733,680	672,469	657,776	831,254	745,074
2000	747,248	747,248	722,426	717,981	931,127	783,181
2001	736,066	736,066	723,029	731,678	1,009,466	996,050
2002	824,124	824,124	728,139	670,526	1,229,475	1,149,128
2003	833,693	833,693	794,206	868,234	1,318,205	1,274,664
2004	698,772	698,772	896,482	845,002	1,584,224	1,498,345
2005	680,168	680,168	847,367	872,516	1,653,016	1,579,905
2006	741,172	741,172	776,943	755,590	1,641,743	1,631,509
2007	763,902	763,902	955,045	958,111	1,716,833	1,743,537
2008	666,925	666,925	950,375	947,652	1,690,318	1,597,009
2009	493,123	493,123	933,587	945,956	1,655,225	1,696,083
2010	450,080	450,080	918,943	899,048	1,836,076	1,751,271
2011	455,101	455,101	794,865	816,917	1,812,458	1,745,628
2012	434,623	434,623	800,988	772,266	1,712,313	1,593,119

Source: Korea Forest Service. 2013 *Statistical Yearbook of Forestry*

in 2012 (2.6 fold decrease from 1990) (Table 7).

By the type of plywood, regular plywood and processed plywood, the regular plywood accounted for 78.4% (341,000 m^3) of the total domestic production as of 2012 (434,000 m^3) and processed plywood, 21.6% (94,000 m^3) (Table 8). By thickness, 6 mm or thinner regular plywood which is used for furniture and interior materials until the 1970's accounted for the most part of regular plywood production. However, the production of 12mm or thicker regular plywood which is for concrete mold began to increase from 1990. As of 2012, 12 mm or thicker plywood accounted for the largest share (71.9%) followed by 6.0–11.9 mm plywood (26.1%), and 6 mm or thinner plywood (2.1%), respectively. The change in production by thickness is attributed to Korea's loss of competitiveness for 6 mm or thinner plywood due to high productivity of Southeast Asian countries. On the contrary, domestic products have competitive edge for 12mm or thicker plywood compared with the low productivity of Southeast Asian countries for the type of plywood (Table 9).

Boards are divided into particle board (PB) and medium–density fiberboard (MDF), and they have made great progresses as the alternative for plywood from the 1990's. PB is mainly applied to kitchen furniture, office furniture, sound system case, general furniture, construction materials, and housing facilities. MDF is also applied to general furniture, office furniture construction material, floor covering, sound system case, and instrument (Korea Timber Panel Association, 2013).

PB production increased from 165,000 m^3 in 1990 up to 718,000 m^3 in 2000, and 801,000 m^3 in 2012. MDF production also increased noticeably from 113,000 m^3 in 1990 up to 931,000 m^3 in 2000, and 1,712,000 m^3 in 2012. This is contrary to the downturn of plywood following the peak in the 1980's. According to the production of plywood compared with boards (PB+MDF), the plywood production in 1990 was 1,124,000 m^3 and the board production, 278,000 m^3, and the boards only accounted for 20%. However, the production of boards increased rapidly from the end of 1990's and reached up to 1,654,000 m^3 in 2000 with the share of 69%. It continued to increase and reached 2,513,000 m^3 in 2012 with the share of 85%. Especially, the share of MDF was only 8% in 1990, however, increased up to 39% in 2000 and 57% in 2012. This

Table 8. Trends of Plywood Production

(Unit: m^3)

Year	Total	Regular Plywood	Processed Plywood
2003	833,693	665,095	168,598
2004	698,772	561,287	137,485
2005	634,630	513,333	121,297
2006	673,815	540,306	133,509
2007	698,743	615,410	83,333
2008	598,635	535,688	62,947
2009	438,859	379,675	59,184
2010	391,853	344,239	47,614
2011	405,268	364,102	41,166
2012	434,623	340,746	93,877

Note: This table represents the plywood production by the members of Korea Timber Panel Association.
Source: Korea Timber Panel Association. 2013 *Plywood and Board Statistics*

Table 9. Trends of Regular Plywood Production by Thickness

(Unit: m^3)

Year	Total	3.5mm or Less	3.6–5.9mm	6.0–11.9mm	12.0mm or Thicker
2003	665,095	32	6,343	36,218	622,502
2004	561,287	7	5,035	47,556	508,689
2005	513,333	69	5,441	51,454	456,369
2006	540,306	30	7,698	66,930	465,648
2007	615,410	–	9,138	90,257	516,015
2008	535,688	–	7,732	77,516	450,440
2009	379,675	–	9,000	47,120	323,555
2010	344,239	–	9,647	55,289	279,303
2011	364,102	–	11,261	51,804	301,037
2012	340,746	–	7,017	88,858	244,871

Note: This table represents the plywood production by the members of Korea Timber Panel Association.
Source: Korea Timber Panel Association. 2013 *Plywood and Board Statistics*

is attributed to the increase of repair and remodeling of old buildings from the 2000's and the continuous increase of construction demand such as pension.

Import

The import of plywood was close to zero until the 1980's, however, has continuously increased from the late 1990's. The quantity has remained around 1200,000 m^3 in the 2000's without much changes for the import is increasing in the form of replacing the decrease in domestic production. Plywood import in 2013 was 1,287,000 m^3, and the largest volume (610,000 m^3) was imported from China followed by Malaysia (358,000 m^3), Indonesia (115,000 m^3), and Finland (47,000 m^3), respectively. The import of plywood from China increased noticeably from the 2000's contrary to the decrease in import from Southeast Asia (Figue 4).

The import of PB increased from 485,000 m^3 in 2000 up to 759,000 m^3 in 2005 and 955,000 m^3 in 2006, which was the highest in history. However, the figure took the downturn afterwards and recorded 857,000 m^3 in 2013. PB is mainly imported from Thailand and Rumania. Especially, the import from Thailand increased from 144,000 m^3 in 2000 up to 690,000 m^3 in 2006 (4.8 fold increase from 2000), which was the highest in history.

The import of MDF recorded 753,000 m^3 in 2002 and turned to declining path afterwards, and it recorded 266,000 m^3 in 2010 and further decreased down to 130,000 m^3 in 2013. Most MDF is imported from China, and the import which was only 8,000 m^3 in 2008 grew up to 237,000 m^3 in 2007, which was the highest figure in history. On the contrary, the import from Australia radically increased from 124,000 m^3 in 2001 up to 78,000 m^3 in 2005 and 2,000 m^3 in 2013.

Export

Most plywood produced in Korea was exported until the 1970's. However, the export decreased rapidly as Korean plywood lost competitiveness in the overseas market and the domestic demand increased from the 1990's. The export of plywood decreased from 118,000 m^3 in 2000 down to 115,000 m^3 in 2005, and 6,000 m^3 in 2013 (Figue 5).

The export of PB also has its focus on domestic supply. 95.0% of PB production is spent through domestic supply and only few of them are exported, mainly to Japan. 70.7% of the total amount of export in 2013 which is 4,000 m^3 was exported to Japan.

MDF also concentrates on domestic supply than export. 90.1% of MDF produced is supplied domestically and only about 5.2% is exported. MDF export decreased greatly from 99,000 m^3 in 2000 down to 48,000 m^3 in 2005, and 20,000 m^3 in 2012. Later on, the export took an increasing trend and recorded the highest figure in history, 105,000 m^3, in 2012. This is attributed to the rapid increase of export to the Middle East to which nearly no export was made before 2010. In addition, the export to Japan still remains significant in quantity.

Trends of Supply and Demand Othter Timbers

Paper and Paterboard

The production of paper and paperboard noticeably

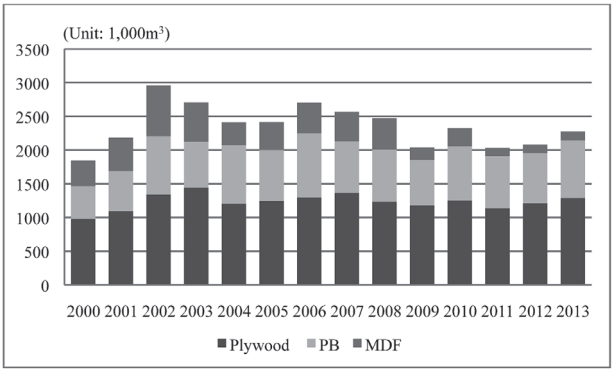

Fig. 4. Trends of Timber Boards Import.
Source: Korea Forest Service. 2013 *Forest Product Import/Export Statistics*

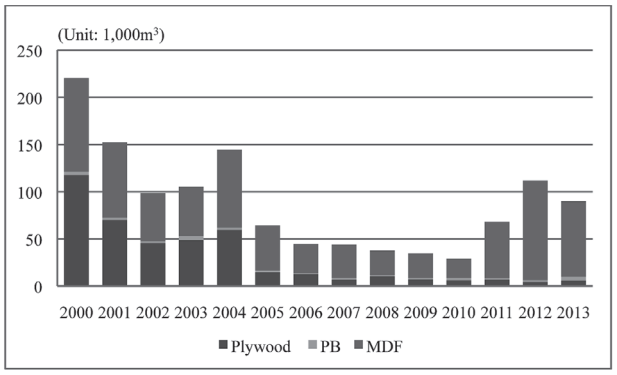

Fig. 5. Trends of Timber Board Export.
Source: Korea Forest Service. 2013 *Forest Product Import/Export Statistics*

Table 10. Trends of Paper and Paperboard Production

(Unit: ton)

Year	Total	Newsprint Paper	Printing Paper	Wrapping Paper	Paperboard	Other
2008	10,642,495	1,561,652	3,094,409	219,942	5,166,021	600,471
2009	10,480,673	1,464,229	2,976,980	217,659	5,219,247	602,558
2010	11,105,835	1,556,101	3,029,585	220,368	5,644,422	622,359
2011	11,480,372	1,537,479	3,278,415	223,436	5,817,538	623,504
2012	11,331,970	1,523,288	3,207,348	190,442	5,769,479	641,413

Source: Korea Paper Manufacturers' Association. 2013 *Paper Supply and Demand Statistics*

increased from the 1990's and reached 5.10 millio tons in 1990, 10.24 million tons in 2000, and 11.33 million tons in 2012. The examination of the production of paper and paperboard by products showed that the paperboard accounted for the largest share, 5.76 million tons in 2012 followed by printing paper (3.20 million tons), newsprint paper (1.52 million tons), and wrapping paper (0.19 million tons) (Table 10).

The import of paper and paperboard was 858,000 tons as of 2012, and the paperboard accounted for the largest share, 311,000 tons, followed by printing paper (210,000 tons), and wrapping paper (52,000 tons) (Table 11). The export increased rapidly from the 2000's and reached 2697,000 tons in 2008, 2995,000 tons in 2010, and 3145,000 tons in 2012. The printing paper accounted for the largest share, 1,296,000 tons, followed by paperboard (1,033,000 tons), and newsprint paper (702,000 tons) (Table 12).

Pulp

Pulp production remained around 600,000 tons or less in the 2000's without noticeable changes in quantity. The total pulp production as of 2012 was 562,000 tons, and it included 450,000 tons of chemical pulp and 112,000 tons of mechanical pulp. While pulp import has remained around 2,500,000 tons, the import is absolutely

Table 11. Trends of Paper and Paperboard Import

(Unit: ton)

Year	Total	Newsprint Paper	Printing Paper	Wrapping Paper	Paperboard	Other
2008	816,871	4,338	224,488	49,355	261,467	227,223
2009	714,472	1,557	205,485	45,593	239,677	222,160
2010	898,643	1,932	258,412	49,884	321,036	267,379
2011	871,305	585	211,323	49,472	319,482	290,443
2012	858,396	92	210,430	51,891	310,675	285,308

Source: Korea Paper Manufacturers' Association. 2013 *Paper Supply and Demand Statistics*

Table 12. Trends of Paper and Paperboard Export

(Unit: ton)

Year	Total	Newsprint Paper	Printing Paper	Wrapping Paper	Paperboard	Other
2008	2,696,509	582,527	1,072,465	21,173	959,972	60,372
2009	2,889,560	661,336	1,074,348	24,186	1,070,429	59,261
2010	2,829,937	688,010	1,017,192	22,482	1,021,979	80,274
2011	2,994,848	685,043	1,275,647	24,668	926,035	83,455
2012	3,144,589	702,217	1,296,007	23,255	1,033,031	90,079

Source: Korea Paper Manufacturers' Association. 2013 *Paper Supply and Demand Statistics*

Table 13. Trends of Pulp Supply and Demand

(Unit: 1,000 ton)

Year	Production			Export	Import
	Total	Chemical Pulp	Mechanical Pulp		
2000	594	419	175	–	2,166
2001	554	427	127	–	2,319
2002	534	419	115	–	2,532
2003	523	415	108	–	2,455
2004	545	427	118	–	2,568
2005	512	411	101	–	2,087
2006	516	426	90	–	2,422
2007	418	338	80	–	1,728
2008	536	425	111	–	2,482
2009	467	361	106	83	2,389
2010	511	402	109	82	2,545
2011	585	447	138	26	2,538
2012	562	450	112	4	2,385

Source: Korea Forest Service. 2013 *Statistical Yearbook of Forestry*

greater than the production. The ratio of imports in the supply and demand of pulp is 82.8% as of 2012. Pulp export is quite small compared with the import (Table 13).

CONCLUSION

Timber consumption in Korea reached around 27 million m^3 a year while the self–sufficiency rate for timber is only 16.2% as of 2012. Korea had to depend on imports for the timber supply as its economic development started after the forest resources were devastated by the Korean War. Recently, the self–sufficiency for timber is gradually increasing; however, most of domestically produced timber is used to produce pulp and low–end goods such as boards.

Although self–sufficiency for timber is influenced by domestic economic conditions and the price of imports, it has steadily increased due to the policy promoting the use of domestic timber and the increase of afforestation projects and species renewal projects which are becoming more advanced. However, the wood produced in Korea is mostly small–diameter logs for forest resource management in Korea focuses on afforestation and species renewal and Korea has to depend on imports for large–diameter logs. The import of log from New Zealand which represents Radiatapine accounts for the largest share, 68% (as of 2013), of total log imports, however, has gradually decreased in the 2000's while the import from North America has continuously increased. In addition, the log import from Japan centering on cypress and cedar is increasing at a fast rate although the quantity is quite small compared with other exporters as more and more consumers are perceiving Japanese timber as quite effective for health.

Although the import of wood products such as sawn wood has continuously increased contrary to the recent decrease of log imports, the increase is quite small in quantity. Log still takes up a major part of import in the domestic wood processing industry as much as the sawn wood accounts for only 30% of the logs and sawn wood imported.

Meanwhile, PB and MDF are showing strong competitive relationship with plywood in Korea. Contrary to the fact that Korean plywood industry lost its competitiveness in the overseas market in the 1990's and also lost competitive edge for interior materials to Southeast Asian countries, the domestic production for PB and MDF has expanded steadily. The domestic production for PB and MDF and its market has been expanding in the 2000's alongside the economic development and the demand for qualitative enhancement of residential environment which boosted the trend of using wood for interior materials and in living. Especially, the share of MDF in wood board (plywood, PB, MDF) production increased heavily from 8% in 1990 up to 57% in 2012. The MDF market is expected to expand further due to the increase of demand for MDF as the material for furniture and interior.

According to the Comprehensive Plan for Promoting Wood Industry (2012–2016) established by Korea Forest Service in 2011, they set up the goal of increasing the self–sufficiency for timber up to 20% as of 2016 (Korea Forest Service, 2011). Furthermore, President Keun–hye Park also promised to increase the self–sufficiency for timber up to 21% as of 2017 through her campaign promise. These plans were devised based on the prospect that the production and supply of domestic timber would increase as domestic forest resources are growing rich. Therefore, the use and application of domestic forest resources will become a new task for timber supply and demand, and necessary actions shall be taken accordingly.

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