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SITUATION OF WOOD-BASED PANEL INDUSTRY IN TURKEY

Kadir DOĞAN
SFC Integrated Forestry Products Industry Trade Corporation, Turkey
Tel:0090 366 2141009, Fax:0090 366 214 6247, E-mail:kadir.dogan7137@gmail.com

M. Hakan AKYILDIZ
University of Kastamonu, Faculty of Forestry, Turkey
E-mail: mhakyildiz@kastamonu.edu.tr

Abstract:
In this study, production capacities, export and import figures of industrial organizations of MDF, Particle Board, OSB, Laminated flooring, and Plywood operating in production activities in the wood-based panel industry in Turkey and with respect to this figures, consumption quantities and raw material needs for production between 2011 - 2015 have been viewed. Besides, contribution of board industry sector to the economy and employment and position of the Turkish board sector within European and world countries have been examined. Within the scope of the study, primarily, sector representatives of board industry in Turkey are listed. Potential of the market has been examined by stating the export and import figures by the board product range, location of the factories in which they operating in production, their production capacities and product range. Raw material inputs which are very important for board industry and effects of these inputs to the unit price have been viewed. Position of Fiberboard (MDF), PB, and Laminated flooring products from Turkish wood-based panel industry within the European and world countries has been examined. Accordingly, Turkey is in 1st place in Europe and 2nd place in the world in MDF production, 3rd place in Europe and 5th place in the world in Particle Board production, and 7th place in the world in sum of PB and OSB. In production of Laminated flooring, it is in the 2nd place in Europe and 3rd place in the world. Approximately 20% of the sales of Western European countries has been carried out in Turkey. Also, it is in the 35th place in production of plywood which is among the other wood-based panel industry products and 25th place in veneer in the world. Contribution of the sector to the economy and employment is great; however, the main problem of the sector is that the supply of wood which is the main raw material is not sufficient and it is expensive compared to the European and other countries.

Key words: *MDF (medium-density fiberboard); particle board (PB); laminated flooring; plywood; Turkey.*

INTRODUCTION

Wood-based panel industry is named as wooden and forestry products, is one of the leading 58 sectors of Turkey, is included in the manufacturing industry. This sector was established by public finance in 1950s and it has established its basic structuring on timber, parquet, woodwork, and board (plywood, particle and fiber board) industrial concept. It has been among the first examples of enterprises and establishments privatized since 2000. Many enterprises of the sector which has been subjected to restructuring of the private sector and technological advancement continue to carry out production in its activity area. The sectors of furniture and paper products using wood and wood-based raw materials have been taken out of this sector. Non-wood forest products which has contained raw materials of many sector for the recent years have been added to the sector of forestry and wooden products, increased the product range of that sector, and provided the opportunity for new markets in export (TOBB, Assembly sector report of Turkish forestry products 2015).

Industrial sector of forestry products has an important place in national and international trade due to production size it has and the foreign trade volume. Within the industrial sector of forestry products producing products of different specifications by processing round wood obtained from forests, group of wood-based panels stands out due to developing and changing production and economic conditions (Yıldırım et al. 2016). It increases the need to the wooden board products that solid materials are not sufficient in cases requiring use of wood on wide surfaces. Products such as particle board, fiberboard, particle board, plywood, and veneer meets many needs since they are more effortless and economic than solid products and thus, they has attracted attention in both Turkey and the world in recent years (Yıldırım et al. 2015).

The size of the sector which provides employment to directly to four hundred thousand and totally one million persons is around 12 billion USD. The target for 2023 is 25 billion USD. This sector has two important sub-sectors. The first one is furniture and decoration sector and the second one is the sector of particle board and fiberboard and wooden products which meet the need of semi-product of the furniture sector. (OAIB sector report 2015). In our country, establishment making production with the investments having increased in the recent years and advanced technology in world standards has been established in particle board and fiberboard sector and a leading capacity and production technology in the world have been attained. According to the 2015 sector report of Central Anatolian Exporters' Associations (OAIB), Turkey is in the 1st place in Europe and 2nd place in the world in production of Fiberboard (MDF) production, 3rd place in Europe and 5th place in the world in production of Particle Board production, and 2nd place in Europe and 3rd place in the world in Laminated flooring production. Totally 25 different firms continue to make production in 34 different locations in board sector. All companies making production in Turkey have been gathered under the roof of Particle-Fiberboard Industrialists' Association. Also, 79 establishments have the production capacity of 558.264m³ in the plywood sector registered to the database of Turkish Union of Chambers and Commodity Exchanges (TOBB).

Forestlands of the world are approximately 4 billion hectares (ha) and it is one-third of the total lands. Nearly all the forests consist of natural forests (95%) and a very little part of it does so of plantation forests (5%). Rates of continents to forests are 46% for Europe, 25.7% for North and Central America, and 21.8% for Africa. Russian Federation, Brazil, Canada, USA, and China which are the five richest countries in terms of forests have the half of total forestlands (TOBB, Assembly sector report of Turkish forestry products 2015). In Turkey, according to the data obtained as the result of update on the database of forest management plans (ENVANİS) renewed between the years of 2013 and 2015, forestland of the country has been detected to be 22.3 million hectares. That forestland is 28.6% of the general area of the country. Wood assets increased to 1.6 billion m³ in 2015. Forestland of Turkey covers 28.6% of the area of 78 million hectares. Forestlands without trees have not been added to these areas (OGM 2017). According to the information in forest management plans renewed today, annual average revenue obtained from forestlands has been determined to be as follows: From high forests: 15.942.459m³, From coppice forests: 2.372.162m³, Totally: 18.314.621m³. According to the information MDF and Particle Board Industrialists' Association, supply sources for wooden raw material required for MDF and PB: 1. From General Directorate of Forestry; fiber particle wood, wood for paper coming to the sector, firewood coming to the sector, 2. From private sector; poplar, willow etc., industrial wastes such as wood dust coming to the sector, 3. Imported from abroad; wood particle (chips) and woods.

In this compilation, production, export, and import figures of MDF, PB, OSB, Laminated flooring, plywood and board consumption quantities from wood-based panel industry in Turkey, Europe, and the world have been shown. Thus, it is tried to examine the change between production and consumption and to analyze the status of the board industry in next years. With the contribution of board industry to the Turkish economy and employment and its position in Europe and the world, importance of the board industry within the sector of forestry products is tried to be shown. With this presentation, it is targeted to strengthen the position of the Turkish panel industry having an important place in Europe and the world and improve the competition conditions with the other board industry establishments in Europe and the world.

MATERIAL AND METHOD

In this study, production, export, and import data of MDF - HDF, Particle Board, OSB, and plywood boards among the wood-based panel products in Turkey, Europe, and the world have been tried to be examined from FAOSTAT database. Production and sales data of laminated flooring by years have been taken from annual data of Domotex conference published on the website of EFPL, European laminated flooring parquet producers' establishment. Turkish board industry raw material need has been tried to be assessed with the data obtained from the report of MDF and Particle Board Industrialists' Association. Production and foreign trade data of these products have been compared to the European and world foreign trade data of the sector, position of the sector in Europe and the world has been probed, and up-to-date status of the sector has been interpreted with the help of numerical datas. Data of foreign trade of Turkey has been obtained from the database of Central Anatolian Exporters' Associations, TOBB Assembly sector report (2015), and TÜİK (Turkish Statistics Institution) (2015) database.

Definitions, characteristics, and area of use of the products subjected to examination have been stated below. These products, respectively, are;

Particle Board; product definitions and characteristics; Particle Board; "they are the boards obtained by gluing and laying of particles obtained from wood pieces (wood particles, saw dust, shavings etc.) and/or other lignocellulosic materials (from lignified plants such as flax, hemp harl, water-extracted sugar cane pith, etc.) and mixing with hardening materials and materials providing the hydrophobical property, and pressing under temperature and pressure." 3-layers board production is realized in single or multiple-floor presses with or without interruptions in particle board sector (OAIB sector report 2015).

OSB board definition: According to EN 13986:2004, OSB is a multilayered boards consisting of wood particles (strands) in form of stripes longer than 50 mm and narrower than 2 mm with an adhesive. Particles in form of stripes on the outer layer have been aligned in parallel with the width and length of the board. Particles in the inner layer are randomly oriented or aligned and generally they are perpendicular to the particles in form of stripes on the outer surface. In the following Table 1, firm names, locations,

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pp. 617-629

establishments capacities, and active years of the industrial establishments of Particle Board and OSB operating in Turkey have been listed.

Table 1

PB and OSB Factories operating in Turkey and Installed Capacities

Nr.	Company	Place	Product	Capacity m³/day	Capacity m³/year	Year of operating
1	KASTAMONU ENTEGRE	BALIKESIR	PB	1.700	544.000	2005
		Gebze/KOCAELI		1.500	480.000	2010
		KASTAMONU		670	214.400	1975
		Terme / SAMSUN		550	176.000	1990
		Tarsus / MERSİN		500	160.000	1997
2	YILDIZ ENTEGRE	Mudurnu / BOLU		1.150	368.000	2012
		Akhisar / MANİSA		1.700	544.000	2012
3	STARWOOD	İnegöl / BURSA		150	48.000	1997
				950	304.000	1995
				1.750	560.000	2004
4	YILDIZ SUNTA MDF	İzmit / KOCAELI		1.700	544.000	2010
5	ORMA	ISPARTA		1.500	480.000	2012
				300	96.000	1978
				300	96.000	1981
6	TEVERPAN	Çerkezköy / TEKIRDAĞ		450	144.000	2001
7	SUNTASAN / KÜPELİLER	ESKIŞEHIR		300	96.000	1981
8	S.F.C. KRONOSPAN	KASTAMONU		200	64.000	1978
9	GENTAŞ A.Ş	BOLU		96	30.720	1992
10	DASAŞ ENTEGRE AĞAÇ	Devrek / ZONGULDAK		340	108.800	1975
11	VEZİRAĞAÇ	Vezirköprü / SAMSUN		175	56.000	1996
12	KÜPELİLER SİMAV	Simav / KÜTAHYA	OSB	300	96.000	1982
13	S.F.C. KRONOSPAN	KASTAMONU		300	96.000	2011
14	SUMAŞ A.Ş.	Edremit/ BALIKESİR		150	48.000	2004
PB and OSB TOTAL INSTALLED CAPACITIES				**16.731**	**5.353.920**	

According to the data of MDF and Particle Board Industrialists' Association, Particle Board and OSB factories operating in Turkey is 14 by the number of firms and 19 by the provinces. Installed capacity is daily 16.731m³/day and annually 5,353,920m³/year. Particle Board and fiberboard industries are within intensive relationship with furniture, forestry, glue and chemical material production sector, timber factories and carpenters, paper sector, construction sector (prefabricated house construction), decoration, wood traders, petroleum product sellers, automotive sector, energy sector, profile producers, forest-village cooperatives, cement production sector, and metal industry (OAIB sector report 2015). According to market researches, it is stated that purchase in the highest quantity in European particle board sector is made by furniture sector, 82% of particle board is consumed by furniture sector, and it is followed by construction, door, and other sectors (Turkish forest products sector assembly 2015). Particle Board and fiberboard industries are within intensive relationship with furniture, forestry, glue and chemical material production sector, timber factories and carpenters, paper sector, construction sector (prefabricated house construction), decoration, wood traders, petroleum product sellers, automotive sector, energy sector, profile producers, forest-village cooperatives, cement production sector, and metal industry (OAIB sector report 2015). OSB activities in Turkey continue in three provinces in daily 750m³/day and annually 240,000m³. By FAOSTAT 2016 data, PB and OSB production quantities in Turkey, Europe, and the world in the last five years between 2011 and 2015.

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Vol. 13 N° 4 2017
pp. 617-629

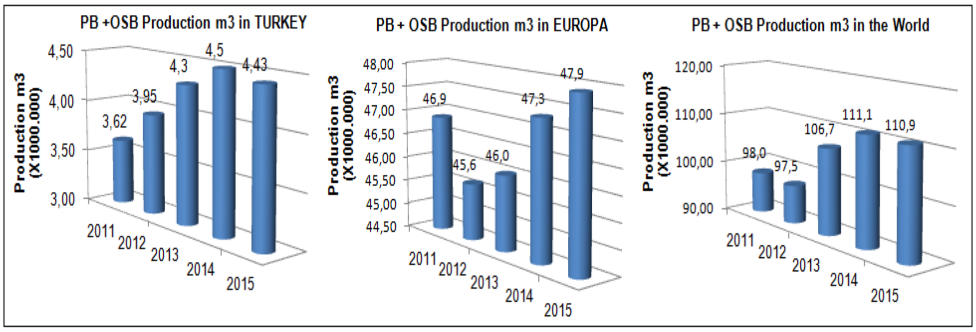
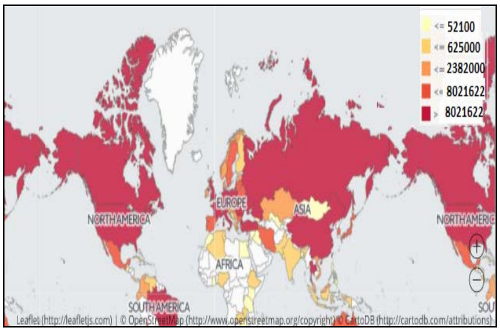


Fig. 1.
PB and OSB Production Quantities.

PB and OSB production map in the world is shown in Fig. 2 and graphic of Particle Board and OSB distribution rate is shown in figure 3 (FAOSTAT 2016).



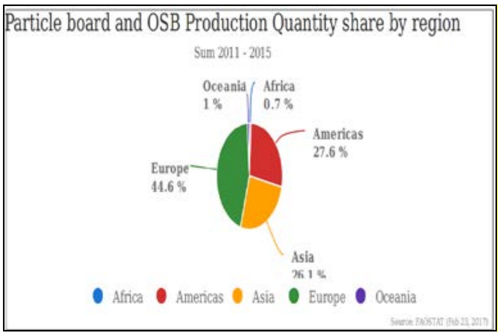


Fig. 2.
PB and OSB production map.

Fig. 3.
Particle Board and OSB distribution rates.

From 2011 to 2015, total production quantity of PB and OSB in Turkey, Europe, and the world has respectively increased approximately by 22%, 2,2%, and 13%. The biggest increase in total production quantity of PB and OSB is observed in Turkey. Particle Board and OSB production distribution rates regionally based on FAOSTAT data are shown in Fig. 3. PB and OSB consumption in Turkey have increased until 2013; however it has decreased by 0.96% between 2014 and 2015. Change in consumption is shown in Table 2.

Table 2

Turkey PB + OSB Consumption (million m³)

	2011	**2012**	**2013**	**2014**	**2015**	**Change % 2015-2014**
Production	3.62	3.95	4.30	4.50	4.43	-1.56
Import	0.33	0.48	0.43	0.27	0.22	-15.85
Export	0.32	0.32	0,31	0.48	0.41	-14.76
Apparent Consumption	3.64	4.11	4.42	4.28	4.24	-0.96

PB and OSB consumption in Europe have decreased until 2013; however it has increased by 0.73% between 2014 and 2015. Change in consumption is shown in Table 3.

Table 3

European PB + OSB Consumption (million m³)

	2011	**2012**	**2013**	**2014**	**2015**	**Change % 2015-2014**
Production	46.9	45.6	46,0	47.3	47.9	1.26
Import	13.08	13.17	13.95	14.99	15.15	1.08
Export	15.48	16.76	17.04	18.04	18.47	2.41
Apparent Consumption	44.48	42.06	42.93	44.25	44.57	0.73

PB and OSB consumption in the world have constantly increased until 2015; however it has changed much with the rate 0.03% between 2014 and 2015. Change in consumption is shown in Table 4.

Table 4

World PB + OSB Consumption (million m³)

	2011	2012	2013	2014	2015	Change % 2015-2014
Production	98.0	97.5	106.7	111.1	110.9	-0.12
Import	23.45	23.75	25.73	27.31	27.96	2.38
Export	23.20	25.02	25.94	28.05	28.54	1.75
Apparent Consumption	98.29	96.22	106.53	110.33	110.35	0.03

According to the annual assessment data for forest products in 2015; apparent consumption of particle board has decreased by 0.6% in Europe. The highest five consumer market for particle board (respectively; from top to down); Germany, Poland, Turkey, Italy and England. Total consumption is equal to 60% of Europe. In 2015, area of use of particle board is generally is furniture industry and other application areas are in construction sector in Europe. OSB consumption has been 5.5 million m³ in Europe and the rate has increased by 5.5% (Forest Product Annual Review 2015).

Fiberboard (MDF) definition: It is defined as "the boards produced as the result of forming by using special adhesive material and benefiting from natural adhesion and felting characteristics of vegetable fiber and fiber clusters". MDF board industry has first been established in Ordu in 1985 in Turkey. Fiberboard sector is included in Article "44" with the 12 digits "Fiberboards from wood and other non-wooden materials (whether agglomerated with resins or other organic materials" with the GTSP number "4411". Particle Board and fiberboard industries are within intensive relationship with furniture, forestry, glue and chemical material production sector, timber factories and carpenters, paper sector, construction sector (prefabricated house construction), decoration, wood traders, petroleum product sellers, automotive sector, energy sector, profile producers, forest-village cooperatives, cement production sector, and metal industry (OAIB sector report 2015).

According to the data of MDF and Particle Board Industrialists' Association, MDF factories operating in Turkey is 15 by the number of firms and 20 by the provinces. Installed capacity is daily 21.185m³/day and annually 6,779,200m³/year. Some firms have multiple MDF factories in the same province. Fiberboard (MDF and HDF) is used in raw form and in a decorative melamine-surfaced form intensively in furniture sector since it is easy to process and its resistance and quality values are high. Also, it is intensively used in door sector as well as it is easily preferred in construction sector, decoration, and various applications. Between the years of 2011 and 2015, MDF and HDF production quantities in Turkey, Europe, and the world are given in Fig. 4.

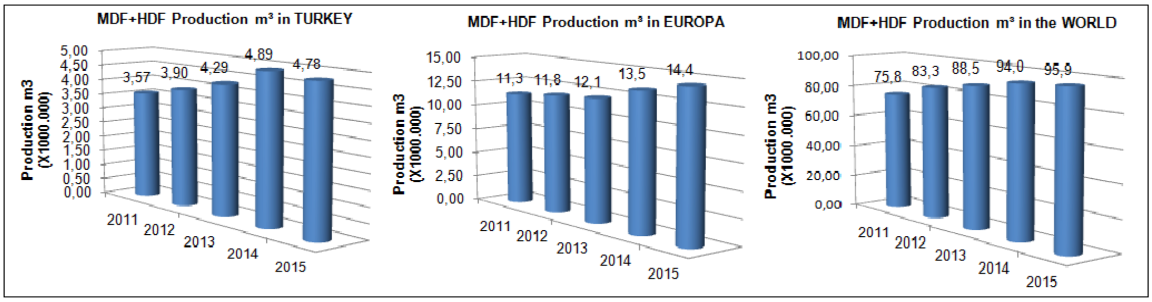


Fig. 4.
MDF and HDF Production Quantities.

From 2011 to 2015, total production quantity of MDF and HDF in Turkey, Europe, and the world has respectively increased approximately by 34%, 28%, and 26%. The biggest increase in total production quantity of MDF and HDF is observed in Turkey. MDF factories operating in Turkey are shown Table 5.

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PRO LIGNO
www.proligno.ro

Vol. 13 N° 4 2017
pp. 617-629

Table 5

MDF Factories operating in Turkey and Installed Capacities

Nr.	Company	Place	Product	Capacity m³/day	Capacity m³/year	Operating year
1	YILDIZ ENTEGRE A.Ş	İzmit / KOCAELİ	MDF	1.200	384.000	2007
				1.200	384.000	2006
				1.200	384.000	2001
				1.200	56.000	2009
		Tarsus / MERSİN		1.325	424.000	2012
2	KASTAMONU ENTEGRE	Gebze / KOCAELİ		770	246.400	1994-2009
				580	185.600	2003-2012
		KASTAMONU		1.200	384.000	2008
		ADANA		1.325	424.000	2011
3	YILDIZ SUNTA MDF A.Ş	İzmit / Kocaeli		600	192.000	1997
				1.200	384.000	2009
4	A.G.T A.Ş	ANTALYA		1.325	424.000	2013
5	TEVERPAN MDF A.Ş	Çerkezköy / TEKİRDAĞ		280	89.600	1999
				280	89.600	2001
		Veliköy / TEKİRDAĞ		600	192.000	2005
				175	56.000	2009
6	DİVAPAN A.Ş	DÜZCE		750	240.000	Assembly
				320	102.400	1999
7	ÇAMSAN POYRAZ A.Ş	ORDU		560	179.200	1995
				260	83.200	1985
8	STARWOOD A.Ş	İnegöl / BURSA		600	192.000	2009
				1.325	424.000	2016
9	ÇAMSAN ENTEGRE A.Ş	Hendek / ADAPAZARI		700	224.000	2004
		ADAPAZARI		1.300	416.000	2016
10	VEZİRAĞAÇ A.Ş	Vezirköprü / SAMSUN		600	192.000	2008
11	S.F.C A.Ş KRONOSPAN	KASTAMONU		475	152.000	2003
				900	300.000	Assembly
12	SELOLİT A.Ş	MANİSA		60	19.200	1976
13	BALKANLAR MDF A.Ş	KIRKLARELİ		200	64.000	2013
14	S.B.S A.Ş	M.Kemalpaşa / BURSA		300	96.000	2009
15	BEYPAN (MEHTAP) A.Ş	KAYSERİ		300	96.000	2015
MDF TOTAL INSTALLED CAPACITIES				**21.185**	**6.779.200**	

MDF and HDF production map in Europe and the world is shown in Fig. 5 and world MDF and HDF distribution rates are shown in Fig. 6 (FAOSTAT 2016).

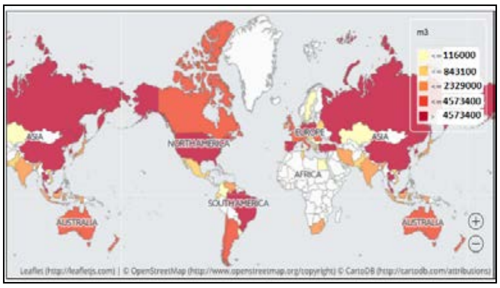

Fig. 5.
World MDF and HDF production map.

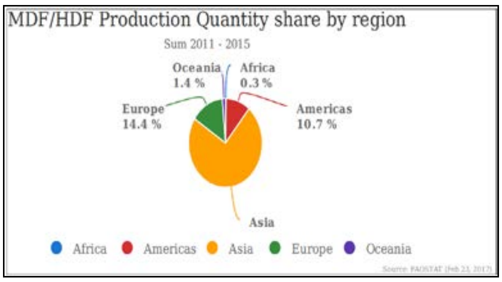

Fig. 6.
World MDF and HDF regional distribution.

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PRO LIGNO
www.proligno.ro
Vol. 13 N° 4 2017
pp. 617-629

Turkey is in the 2nd place after China in production of MDF and HDF board production. In Fig. 7, the top 10 countries in production of MDF and HDF production are shown. Among the European countries, Poland is in 5th place and Germany is in the 9th place in world ranking.

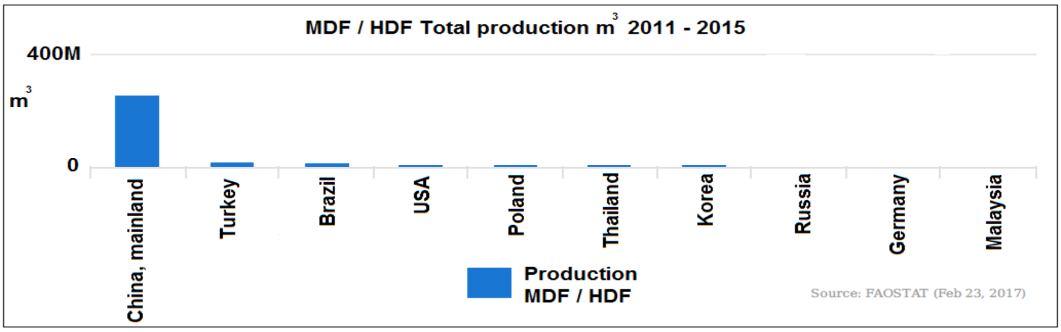


Fig. 7.
Top 10 in World MDF and HDF production.

In Turkey, MDF and HDF board consumption has significantly increased between 2011 and 2014 and decreased by 4.12% in 2015. Change in consumption figures is shown in Table 6.

Table 6

Turkey MDF + HDF Consumption (million m³)

	2011	2012	2013	2014	2015	Change % 2015-2014
Production	3.57	3.90	4.29	4.89	4.78	-2.21
Import	0,31	0.42	0.33	0.25	0.22	-13.39
Export	0.56	0.47	0.36	0.46	0.51	11.14
Apparent Consumption	3.33	3.86	4.26	4.68	4.49	-4.12

No considerable change has occurred in consumption figures between 2011 and 2015 in Europe. An increase by 0.73% is seen in 2015 compared to 2014. Change in consumption figures is shown in Table 7.

Table 7

European MDF + HDF Consumption (million m³)

	2011	2012	2013	2014	2015	Change % 2015-2014
Production	46.9	45.6	46,0	47.3	47.9	1.26
Import	13.08	13.17	13.95	14.99	15.15	1.08
Export	15.48	16.76	17.04	18.04	18.47	2.41
Apparent Consumption	44.48	42.06	42.93	44.25	44.57	0.73

MDF and HDF consumption in the world has continuously increased until 2015 and consumption has increased by 2.61% in 2015 compared to 2014. Change in consumption is shown in Table 8.

Table 8

World MDF + HDF Consumption (million m³)

	2011	2012	2013	2014	2015	Change % 2015-2014
Production	75.8	83.3	88.5	94.0	95.9	2.09
Import	14.42	15.00	14.72	15.04	15.76	4.74
Export	15.98	15.96	16.21	16.93	17.21	1.64
Apparent Consumption	74.27	82.39	86.98	92.07	94.47	2.61

According to the annual assessment data for forest products in 2015; consumption of MDF has decreased by 2.6% in Europe in 2015. Main users of MDF board have been laminated flooring (34%) and furniture sector (45%) among the sub-sectors.

İbrahim Yıldırım et al. (2015) has made their future estimations in relation with consumption quantities from 1995 to 2013 and consumption quantities to 2020 by using multiple regression method in the study which they conducted with the name of projection and economic status of wood-based board sector in Turkey. Accordingly, it is estimated that MDF consumption quantity in Turkey in 2020: 5.3 million m^3, PB consumption quantity: 7 million m^3, 0,7 million m^3.

According to the report of MDF and PB Industrialists' Association, board sector ranking in Europe is shown in Table 9.

Table 9

European board industry ranking

MDF m³ / year			PB m³ / year			Laminate flooring m² / year		
1	**TÜRKİYE**	**5,54**	1	RUSYA	6,64	1	ALMANYA	272
2	ALMANYA	3,79	2	ALMANYA	5,52	**2**	**TÜRKİYE**	**110**
			3	**TÜRKİYE**	**5,30**	3	RUSYA	75

Laminated flooring: It is a flooring board consisting of special protector and transparent film layer on the top, wood textured decorative paper under it, E1-quality HDF, MDF, particle board etc. board, and finishing containing melamine increasing strength and protecting from moisture (TOBB assembly sector report 2015).

Laminated flooring - product structure

(1) Upper layer of melamine coating which is highly resistant to wearing (Overlay)

(2) Decor layer on which decors are printed (Decor paper)

(3) Bearing board from MDF or HDF

(4) Backside (Balance paper)

(5) Easy-to-floor by its interlocking mechanics and easy-to-repair by its low structural height (EPFL, 2016)

Laminated flooring firms launch their products under various brands and different names under these brands. Important laminated flooring firms operating in Turkey and their known brands are shown in Table 10 and firms operating in Europe and member to European Laminated Flooring Producers' Association (EPFL) and their countries are shown in Table 11.

Table 10

Laminated Flooring Firms Operating in Turkey and Their Brands

Company	Çamsan	Kastamonu Integrated		Yıldız Integrated	Vezir Köprü Wood Products	AGT	Yıldız Sunta MDF	Işık Ahşap	SFC Integrated Wood Product
Brand	ParkeLam	Floorpan	Artfloor	Vario Click	Peli Parquet	AGT Parquet	Moonlock	Işık Parquet	Dafne Parquet

Table 11

Some firms operating in Europe and member to European Laminated Flooring Producers' Association (EPFL)

Company	Akzenta	Alsapan Flooring	Baterio Laminate	Egger	Kindl	Krono	Swiss	Skema	Pergo
Country	Germany	France	Belgium	Germany	Austria	Germany	Switzerland	Italy	Belgium

According to 2016 statistical data compiled and published from the reports given by EPLF member countries, total sales of laminated flooring in 2016 have been 476 million m^2. 2007-2016 laminated flooring sales statistics are given in Fig. 8.

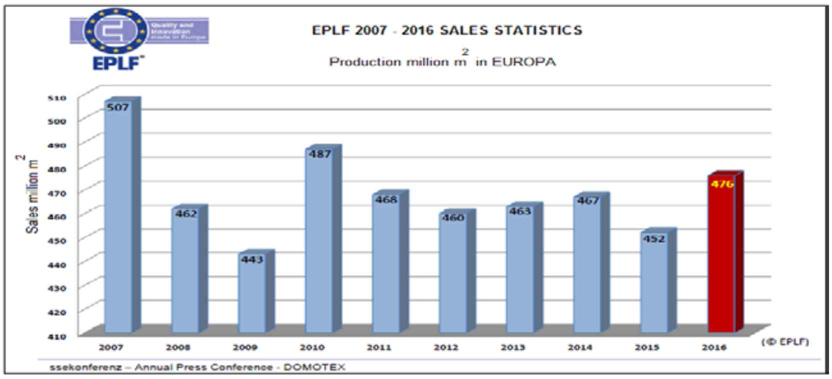
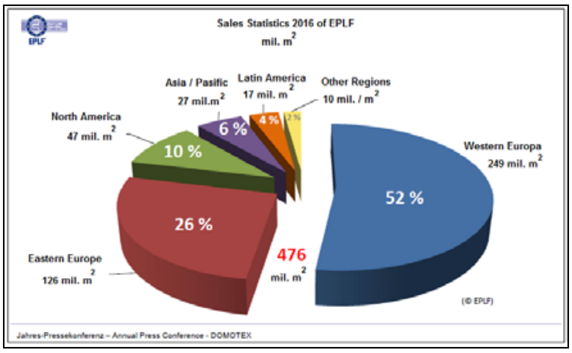


Fig. 8.
Laminated flooring sales statistics.

2016 laminated flooring sales rates of EPLF member countries are shown in Fig. 9. Turkey has been included into Western Europe region. 2016 laminated flooring sales rates of EPLF member countries from Western Europe are shown in Fig. 10.



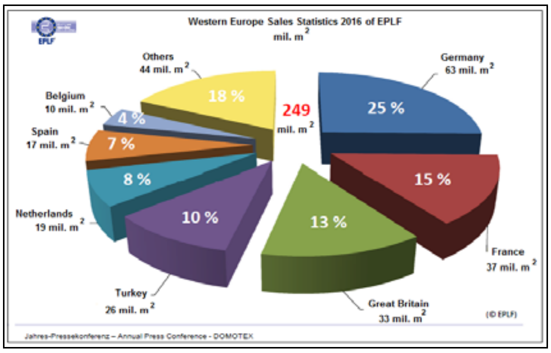


Fig. 9.
Laminated flooring sales rates.

Fig. 10.
Western European countries flooring sales rates.

Plywood's definition is that they are the panels formed by arranging and adhering wooden veneers in a way which fiber directions shall be perpendicular to each other. Plywood consists of minimum three layers. 74 establishments have the production capacity of 479.582m³ in the plywood sector registered to the database of TOBB. Provinces in which the establishments intensify are Adapazarı, Kastamonu, Bolu, İstanbul, Ankara, Bursa, and Çorum. Assembly sector report of Turkish forest products (TOBB 2015). According to sector report of İzmir Chamber of Commerce (İZTO 2014), Turkey is in 35th place among 126 countries in production of plywood with 200 thousand m³ production and 0.1% share. Plywood is a product having a wide range using advantage such as construction sector, packaging industry, advertisement stands, and traffic signs, Central Anatolian Exporters' Associations Plywood report (OIAB 2011). There are many producers and export-import firms operating in plywood sector. Important establishments among them are shown in Table 12.

Table 12

Some Plywood Industry Firms Operating in Turkey

Company	**Bizon Wood Industry**	**Dastaş Demirci**	**Hasep Kaplama**	**Taner Integrated Wood Product**	**Yiğit Construction**	**Sitaş Siteliler**	**Ekol Plywood**	**TKS**	**Çağ Plywood**	**Starwood Forest**	**Bahar Forest**
City	Adapazarı	Adapazarı	Düzce/Bolu	Bursa	İstanbul	Ankara	Kastamonu	Kastamonu	Kastamonu	İnegöl/Bursa	İstanbul

Plywood production quantities in Turkey, Europe, and the world are shown in Fig. 11 (FAOSTAT 2016).

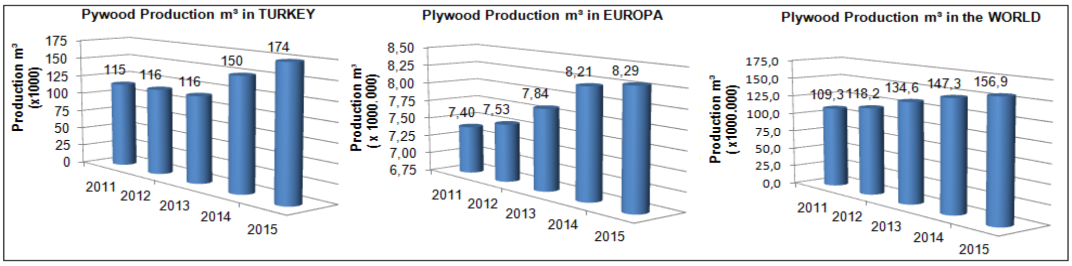


Fig. 11.
Plywood production quantity.

Plywood production has increased by 51.3% in Turkey, 12.0% in Europe, and 43.4% in the world in 2015 compared to 2011. In 2015, production in Turkey has been 2.1% of production in Europe and 0.1% of total Plywood production in the world. World plywood production map is shown in Fig. 12 and Plywood production regional distribution is shown in Fig. 13.

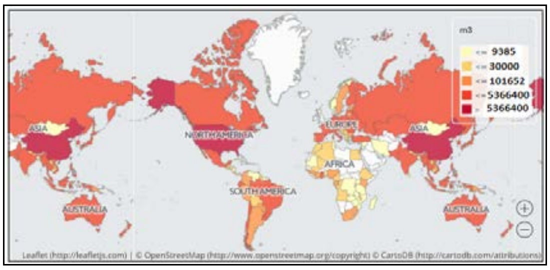


Fig. 12.
Plywood production map

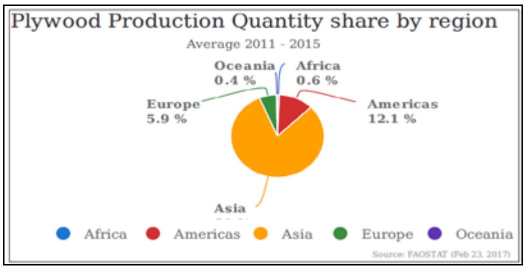


Fig. 13.
World plywood production regional distribution.

When distribution of plywood production in the world is examined, it is seen that the biggest production is made in Asian countries and the lowest production is made in Oceania and African countries. The top 10 countries in which the plywood production is the highest are shown in Fig. 14.

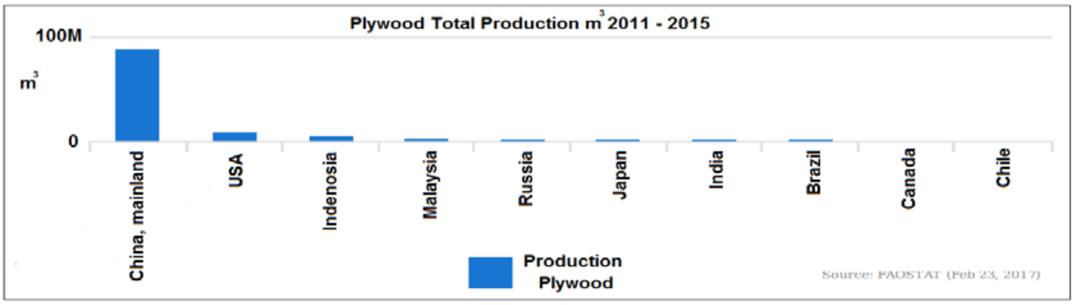


Fig. 14.
The top 10 countries in which the plywood production is the highest.

While China is in the 1st place in plywood production in the world, the second place belongs to United States of America. Plywood consumption in Turkey has increased until 2015 and no change is observed in 2015 compared to 2014. Annual change in consumption is shown in Table 13.

Table 13

Turkish Plywood Consumption (million m³)

	2011	2012	2013	2014	2015	Change % 2015-2014
Production	115	116	116	150	174	16,0
Import	244	268	293	293	279	-4.8
Export	17.5	17.3	4.4	4.2	14.0	237.1
Apparent Consumption	341.5	366.7	404.6	438.8	439.0	0.0

Between 2011 – 2015, plywood consumption in Europe has not changed. It has decreased 1.5% between 2014 and 2015. Annual changes in consumption are shown in Table 14.

Table 14

European Plywood Consumption (million m³)

	2011	2012	2013	2014	2015	Change % 2015-2014
Production	7.40	7.53	7.84	8.21	8.29	1.0
Import	6.86	6.63	6.57	7,14	7.23	1,2
Export	5.51	5.52	5.81	6.25	6.56	5.0
Apparent Consumption	8.7	8.6	8.6	9.1	9.0	-1.5

Between 2011 – 2015, plywood consumption in the world has increased. It has increased by 1.5% between 2014 and 2015. Annual changes in consumption are shown in Table 15.

Table 15

World Plywood Consumption (million m³)

	2011	2012	2013	2014	2015	Change % 2015-2014
Production	109.32	118.18	134.62	147.34	156.85	6.5
Import	23.47	24.05	23.55	24.51	25.09	2.3
Export	25.32	25.85	26.49	28.11	28.62	1.8
Apparent Consumption	107.5	116.4	131.7	143.7	153.3	6.7

Turkish Board export; according to the TÜİK (Turkish Statistics Institution) data published in sector report of Central Anatolian Exporters' Associations, it is seen that while export to Iran in 2010 was around 154.1 million $, it decreased to 101.8 million $ in 2013, this value increased to 131.9 million $ in 2014 and Iran has become in the 1st place. Other markets showing continuous increase in export from 2010 to 2014 are Turkmenistan, Algeria, Romania, and England. 2nd biggest market of Turkey in board export is Iraq. Export of totally 52.5 million $ was made to Iraq in 2014. Export value of Georgia which is the 3rd biggest market was recorded as 47.4 million $ in 2014. While export made to Azerbaijan which is in the 4th place was 19.6 million $ in 2010, this value has increased to 38.2 million $ in 2014. While export made to Algeria which is among the other markets of which export volume always increase was 2.6 million $ in 2010, this value has increased to 8.2 million $ in 2014. In the period from 2010 to 2014, our exports to Romania, England, and Lebanon have respectively increased by 221.4%, 455%, and 408%. According to (FAOSTAT 2016) data, change in export quantities in PB, OSB, MDF-HDF, and Plywood in Turkey between 2011 and 2015 is shown in Fig. 15.

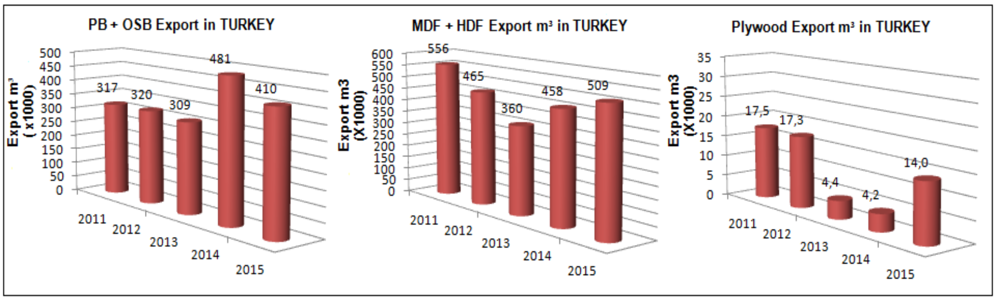


Fig. 15.
Change in export quantities in Turkey.

According to these data, while the highest export volume was in MDF-HDF, the lowest one is in Plywood. It is understood from the graphics that a decrease of 14.7% has occurred in Particle Board and OSB board export and increase of 11.1% has occurred in MDF and HDF export in Turkey in 2015 compared to 2014. It is seen for plywood export that very low rate of export has occurred between 2013 and 2014;

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however it increased again in 2015. According to TradeMap data of 2013, of world board export, 20.3% is realized by People's Republic of China, and then by Germany, Indonesia, and Malaysia respectively by 9.1%, 6.8%, and 6.5%. Turkey is ranked at the 21st place among 139 exporters (OAIB sector report 2015).

Board import: According to TÜİK (Turkish Statistics Institution), when board import is examined based on products, it attracts attention that Turkey made highest amount of import in plywood with 335 million $ and it is followed by MDF and fiberboard import with 223 million $. Particle board and OSB import is in the 3rd place with 78.5 million $. When the most important markets in board import of Turkey are examined, while Romania is in the 1st place with 128.7 million $, it is followed by Russian Federation with 125.7 million $, and Germany is in 3rd place with 76.5 million $ (OAIB sector report 2015). When import quantities are examined, a decrease is seen in PB and OSB productions, MDF-HDF production, and Plywood production until 2015. According to Trademap data of 2013, 14,3% of world board import is made by USA. It is followed by Japan (8.6%), Germany (6.6%), England (4.1%), and France (3.5%). Turkey takes place on the 12th place in board importing of the world among 225 board importers (OAIB sector report 2015). Change in import quantities in PB, OSB, MDF-HDF, and Plywood in Turkey between 2011 and 2015 is shown in Fig. 16 (FAOSTAT 2016).

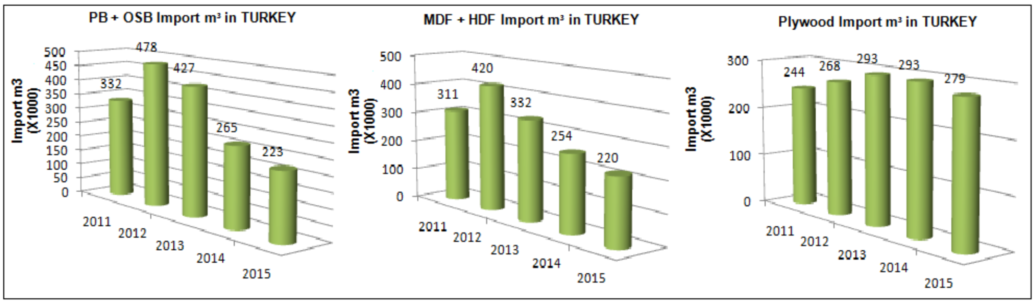

Fig. 16.
Change in import quantities in Turkey.

It is seen from the graphics that imports of Particle Board and OSB imports, MDF and HDF board imports, and Plywood imports respectively in Turkey in 2015 respectively by 15.8%, 13.4%, and 4.8% compared to 2014. It is seen that the highest import quantity has occurred in Plywood industry.

The sector of wooden products and forestry products contains production and trade of many goods out of wood-based boards, particle board, OSB, and fiberboard. Primary items among them are log and timber, solid products made of timber (parquet etc.), finger joint-added solid profile, laminated wooden boards (plywood, veneer), and packaging. Installed capacity using rate of board industry varies between 75% and 80% (OIAB sector report 2015). Chips and wood import is made from abroad since wood and wood-based raw material needed by the sector and corresponding to the capacity using rate of the sector cannot be met from wood and industrial wood waste provided by General Directorate of Forestry and private sector. The main problem of the board industry is that the supply of wood which is the main raw material is not sufficient and it is expensive compared to the international markets. Wood prices in Turkey are two times expensive compared to Europe and three times expensive compared to United States of America, Brazil, Canada, Venezuela, Ukraine, and Russia. The share of the wooden raw materials in the board cost is around 45-53%. Turkey uses the most expensive wood of the world and 30-35% of the total wooden raw material need is met by import wood and wood particles (chips). Although the supply quantity of the wood needed by the sector from internal sources as the result of the studies made by General Directorate of Forestry has increased to 16 million m³ in 2013 from 7 million m³ in 2002, it is not sufficient. For all the needs of the sector to be able to be met from the internal sources, studies of General Directorate of Forestry continue. Maintenance of the forests and sales of General Directorate of Forestry are of great importance for sub-industrial board sector using industrial wood which is thin and not very valuable. Thus, it is required that wooden raw material production in Turkey is to be increased in a way which shall meet the needs of the sector and to be brought to the price level which shall allow international competition. 2015 production capacity of the sector is 9,000,000 - -10.000.000m³/year. For this production, approximately 22 - 24 million stere/year wooden raw material is needed. 25-30% of total raw material need of our sector is supplied from abroad and 70-75% of the same is done so from domestic market.

CONCLUSION

In parallel with the demand to the board industry products in Turkey, increase is apparently seen in number of factories and production capacities. It is observed that there has been increase in Turkey, Europe, and the world in PB and OSB production between the years of 2011 and 2015; however, the biggest increase in the same has occurred in Turkey with the rate of 22%. In PB production, while Turkey is in 3rd place in Europe and 5th place in the world, it is in the 7th place in sum of PB and OSB in the world after Poland. That is because Turkey has fallen behind in OSB production. While there is increase of 29% in export of PB and OSB, a decrease of 32% is seen in import. Contribution of PB and OSB board industry to economy and its contribution to employment with the increasing production capacity and number of facilities are seen from these figures. Increase of 34% has occurred in total production of MDF and HDF in Turkey. While 8.5% decrease is seen in export, 29% decrease has occurred in import. Production capacity of MDF and HDF board industry meets the needs of Turkish market. In parallel with the development of Turkish board industry in the recent years, position it has attained in Europe and the world is so big and important that it cannot be ignored. It asserts the technology, quality and the importance of the sector in the country that Turkey is the 21st biggest board exporter among 139 exporter countries. With the export figures and employment of one million people, the contribution of the sector to the economy is considerable. Although forestland rates and industrial wood sources of Turkey has increased, board industry has had to import 30-35% of total wooden raw material need as wood and wooden particles from abroad since it cannot meet the increasing capacity needs of it. Insufficient wood sources as well as very high cost of wood due to various reasons stand as the biggest barrier competition and development of board industry of which main cost element is wood. The main inputs in the sector are wood and glue and other additives are fuel and energy. Proportionately; the costs are as follows: wood is 42-53%, glue 21-24%, energy is 11%, operation, maintenance, labor, general management, and sales and marketing, and depreciation are 20% (OIAB sector report 2015). As seen from the figures, wooden raw material is in the first place in board costs and it is as much as the sum of other costs. Thus, supply of wooden raw material in the board industry is very important in terms of board costs due to high level of wood prices as well.

Consequently, it is required that the purchasing costs of wood and log are to be decreased for the sector of wood and forest products to have a voice and to be able to compete in international markets. High level of added value obtained from board industry products is important for turkey due to its contribution to the economy and employment. It may be recommended that emphasize is to be laid on production technologies with alternative raw materials due to raw material problem likely to be experienced in the future. Wastes of thinning and maintenance cut left in the forest due to transportation problem and suitable for particle board production may be transported to factories after they are chipped with chipping machines in the forest, plantation of fast-growing tree species may be concentrated on, and production may be supported by renewing the technologies which get old on time. Pool and sprinkling system may be recommended for wooden raw materials in the facilities requiring long-term storing, by holding meetings between producers and users, reasons of the faults may be determined, it may be ensured that the mentioned faults are removed and common standard in the production is reached, and producers may be directed to agricultural forestry in order to produce raw material needed by their sectors. Industrial plantation works of both General Directorate of Forestry and private sector must be supported (OIAB sector report 2015).

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