Chapter

Raw Material Demand-Supply and Policy Recommendations of Turkish Wood-Based Panel Industry

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Abstract

The wood-based panel industry is one of the fast developing and growing sectors in the world. As of the year 2017, Turkey is the fourth biggest wood-based panel producer with a share of 3.9%. The fast sectoral development is considered as a positive indicator, although unplanned growth is not desirable. In this scope, the raw material Turkey possesses, and the opportunity to meet the future demand of the sector has been investigated. The estimated production capacity of Turkey for the year 2018 is calculated as 6,657,294 m^3/year for particle board using two average alternative models. The sector's possible yearly demand concerning the production capacity is approximately 11–12 million m^3 besides the 8–9 million m^3 production from the local production import gain ground. Providing a solution concerning the raw material supply, increasing the industrial afforestation, amplifying the state aid in the local products, and taking the necessary measures in order to decrease the cost is crucial. The said measures might have a significant role to offer a solution for the problems of the sector. The future projections should aim at reaching a solution to the raw material problem and the technical problems.

Keywords: fiberwood, fuelwood, demand, supply, forestry, Turkey

1. Introduction

The development in the forest industry has progressed to the use of solid-like materials rather than solid wood materials. The main reason behind this progress is thought to be the demand and the concern on the capability of meeting this demand. Although wood is an important raw material, it has become more difficult to meet the demand in every passing year [1]. Because the formation of wood-based raw material obtained from forests needs a quite long period of time. The growth of wood-based industries all over the world has made the use of new substitute materials instead of wood inevitable [2–4]. On the other hand, neither the diversity in substitute materials nor the use of both wood-based materials and other materials at the same time has reduced the demand for wood. In this respect, the wood industry is subject to a constant development and change [5]. The wood-based panel industry is an important forest-based one in China. At this point, for example, wood-based panels have high economic importance in China economy. Some projections show that the production of the wood-based panel industry has expanded considerably in recent years and is expected to increase with an average annual growth rate of 1.05% from 2015 to 2030 [6, 7]. One of the most leading sectors in terms of this mentioned change and development has been the board industry.

In fact, the forest industry has been an essential leading branch of the industry since old days in terms of social development [8–12]. Therefore, the use of wood in the industry continues as it was in the past. Similarly, the use of wood as an industrial material is still an important source of income for both those who produce wood and treat wood to produce wood products [13, 14]. When the subject is approached in terms of the industry, another reality is that the particleboard and fiberboard industries have developed particularly in recent years and a heavy raw material demand exists [15]. When the issue is considered from a historical perspective, the industrial production of particleboard started in 1941 in Germany and showed a rapid development after 1948 [16]. Although the fiberboard industry started in the early 1900s, the large-scale commercial production emerged between the two world wars in the United States [17–19]. The main reason for the fact that the particleboard industry first emerged and developed in Central European countries is the desire to substitute wood with a new and more economical construction material with more convenient dimensions and to make savings from wood use just like the other construction materials as a result of the destruction caused by the Second World War [20].

The fact that the private sector completely dominated the forest product industry since the early 1990s has been accompanied by huge investment in the field by private companies. When considered from this point of view, it can be stated that the wood-based panel industry has carried out a great development in the past 20 years in particular [21]. However, rapid growth and development have brought adverse effects as well. The difficulty in meeting raw material demand comes at the top of these adverse effects. The most serious bottleneck in meeting the demand for raw material is considered to be the prices and the amount of the demand [12, 22, 23]. Public dominated production in Turkey has usually been a problem in meeting the raw material demand of the private sector. This situation has led the sector to import, but as a result of the recent changes in the raw material exporting policies of the countries and the economic events, this option has become insufficient in solving the problem.

The estimated production capacity of the board industry in Turkey is 5.1 million m^3 of particleboard per year. As for fiberboard, the production amount is 6.8 million m^3 per year [24]. The total number of production facilities in the sector is 35 of which 19 produce particleboard and 16 produce fiberboard. The total production capacity of the industry is approximately 12 million m^3 per year, whereas the actual production is 8.6 million m^3 per year (Particle Board Industry Association [25]). Therefore, in addition to particleboard and fiberboard purchased by the sector from General Directorate of Forestry (OGM), fuelwood has also been added to the demand list of the sector. Latest investments in the fiberboard and particleboard industries and capacity enhancement attempts are expected to move the sector further. However, the expectation of low raw material supply for the sector is assumed as the biggest obstacle for the companies by the representatives of the sector against production enhancement (particularly in 2013). The expectations by the industry, the production amount of the forestry organization, and the changes in related policies shall directly affect the future of the industry. At this point, it is crucially important to estimate the changes in the raw material supply of the wood-based industry in the forthcoming period.

This study aims to introduce suggestions on meeting the raw material demand, which is considered to be the main problem of the wood-based panel industry. The raw material supply amount of OGM, which is the main raw material supplier for the industry, has been projected by considering the particle-fiber wood, which is an important kind of raw material for the sector, and fuelwood production amount between the years 1977 and 2017. Certainly, the presence of various social and economic factors has been taken into consideration while making the projection. The main factors taken into consideration might be listed as follows: population; gross national product per capita; and afforestation fields, which are important for the sustainability of the forestlands and the unit sale price of the particle-fiber wood and fuelwood. One of the important variables to be considered in terms of the results of the study is the number of companies operating in the board industry and their production capacities. However, these variables have not been able to be evaluated under findings as there are not any regular statistics on the issue, but they have been evaluated in the suggestions provided under the conclusion part instead. The fact that no data can be found on the particle-fiber wood production of OGM until the year 1977 has been effective in gathering data starting from the year 1977.

2. Material and method

As it is known, the dependent variable in an economic event is sometimes affected by a single independent variable and sometimes by more than one independent variable. When the dependent variable is explained by more than one independent variable, multidimensional decision-making methods are used [26]. Multidimensional decision-making methods are suitable for the structure of forest resources, and with the use of the method, more significant decisions and solution offers in forest resources management can be created [27, 28]. In this respect, multidimensional decision-making methods are of the most frequently used methods in forestry studies. Regression analysis is one of the appropriate multidimensional decision-making methods for the study.

In regression modeling, the intended use has to be well defined in order to find the most appropriate regression model [29–31]. Since the long-term data of the previous years (between 1977 and 2017) had been obtained regularly on a yearly basis and the purpose was to estimate the raw material production to meet the demand, regression modeling has been preferred to use. Two techniques are used in regression analyses. They are simple regression analysis and multiple regression analysis. Multiple linear regression modeling has been determined as the most appropriate modeling technique for the study as it provides the chance of evaluating multiple data. Multiple linear regression analysis has been formed for the purposes of revealing how the production amount of particle-fiber wood and fuelwood changes depending on the specified independent variables and determining the raw material amount that can be provided by country resources for the industry. Future projections concerning supply and demand equilibrium have been made regarding the established capacity of the industry (taking into account the available quantitative data range and the data quantity) as well. In terms of research technique, Durbin Watson (DW) statistic and coefficient have been utilized first, in order to test the autocorrelation among the independent variables used in the multiple linear regression analysis.

While determining the particle-fiber wood and fuelwood supply amounts of the wood-based panel industry according to the data by OGM, particle-fiber wood production amount (Y1) and fuelwood production amount (Y2) have been specified as dependent variables. Unit sale price of the particle-fiber wood (X1), unit sale price of fuelwood (X2), afforestation rate (X3), population (X4), and current producer prices in the US dollar basis with the gross national product (X5) have been accepted as independent variables. The data related to the mentioned variables have been derived from the databases of OGM, Turkish Statistical Institute (TÜİK), İstanbul Chamber of Commerce (ITO), State Planning Organization (DPT), and the World Bank. The data including the number of facilities in the industry and

Years		Particle-fiber wood productions (m^3)	Fuel wood productions (m^3)	Particle-fiber wood unit prices ($USD/$m^3$)	Fuel wood unit prices ($USD/$m^3$)	Afforestation (ha)	Population	Gross national product per person (GNPP) ($USD)
		Y_1	Y_2	X_1	X_2	X_3	X_4	X_5
1977	1	171,000	20,309,000	15.24	7.70	37,985	41,316,300	1427
1978	2	184,000	20,071,000	14.84	8.72	34,050	42,206,200	1550
1979	3	173,000	20,046,000	19.66	10.85	27,867	43,132,600	2079
1980	4	164,000	21,949,000	18.63	11.25	20,969	44,347,719	1564
1981	5	180,000	20,192,000	12.75	10.99	45,943	45,130,000	1579
1982	6	439,000	20,372,000	12.06	8.35	53,680	45,353,405	1402
1983	7	742,000	19,851,000	16.06	7.48	66,210	46,965,156	1310
1984	8	953,000	16,659,000	22.38	8.46	87,627	48,735,507	1247
1985	9	884,000	14,289,000	20.83	12.52	100,400	50,664,458	1368
1986	10	1,071,000	12,138,000	15.08	11.05	108,354	51,706,684	1511
1987	11	913,000	12,503,000	23.59	8.18	114,132	52,770,350	1706
1988	12	1,137,000	12,942,000	21.16	12.72	119,369	53,855,897	1745
1989	13	1,193,000	13,062,000	15.20	11.14	113,639	54,963,775	2022
1990	14	1,113,000	12,145,000	17.20	13.47	78,884	56,473,035	2794
1991	15	1,104,000	11,503,000	15.69	12.70	56,752	57,512,139	2736
1992	16	1,177,000	11,146,000	29.50	17.19	24,519	58,570,362	2842
1993	17	1,004,000	10,846,000	36.25	25.44	27,058	59,648,057	3180
1994	18	1,363,000	8,379,000	16.60	10.94	39,652	60,745,581	2270
1995	19	1,320,000	9,539,000	19.46	13.59	24,257	61,863,300	2898
1996	20	1,362,000	10,402,000	32.75	20.20	37,927	63,001,585	3054
1997	21	1,406,000	9,246,000	20.04	14.88	32,031	64,160,814	3144
1998	22	1,278,000	8,372,000	24.17	15.97	25,959	65,341,373	4497
1999	23	1,252,000	8,167,000	21.73	14.25	11,529	66,543,654	4108
2000	24	1,371,209	7,861,442	21.64	14.43	24,494	67,803,927	4317
2001	25	1,254,599	7,576,683	15.10	9.38	25,672	68,064,972	3120
2002	26	1,821,253	7,586,725	22.91	13.61	28,647	68,327,022	3660
2003	27	2,073,150	7,815,932	34.83	22.10	36,914	68,590,081	4718
2004	28	2,329,897	8,119,555	38.67	24.96	34,016	68,854,153	6041
2005	29	2,409,446	7,667,026	42.51	26.85	21,439	69,119,242	7384
2006	30	2,964,647	7,003,026	41.23	25.85	25,319	69,729,967	8035
2007	31	3,265,092	6,834,024	47.64	27.66	18,228	70,586,256	9710
2008	32	3,816,522	7,303,889	52.59	31.71	39,467	71,517,100	10,851
2009	33	4,033,257	7,427,596	41.37	25.86	46,872	72,561,312	9036
2010	34	4,608,171	7,194,372	43.32	27.99	41,857	73,722,988	10,672
2011	35	4,662,578	6,778,101	44.31	26.95	39,964	74,724,269	11,341
2012	36	5,424,794	6,432,674	51.88	36.82	42,009	75,627,384	11,720
2013	37	5,551,397	5,981,703	43.13	27.35	46,656	76,667,864	12,543
2014	38	6,608,416	5,257,995	38.39	25.60	40,325	77,695,904	12,127
2015	39	6,866,355	5,022,986	34.56	21.32	38,986	78,741,053	10,985
2016	40	7,201,462	4,877,067	34.09	19.86	48,230	79,814,871	10,863
2017	41	6,494,372	4,359,646	29.06	20.29	46,935	80,810,525	10,541

Table 1.
Depended and independent variables used in the study and their values.

their production capacity have also been obtained from the databases of the aforementioned institutions and from their reports related to the sector. All the obtained data are given in **Table 1**.

While carrying out the analyses, first of all, the changes in the independent variables (X1, X2, X3, X4, and X5) according to years have been tested using mathematical methods, a method of time-series analysis. In other words, mathematical formulas that represent the correlation and then the probability model have been reached by using the diagram that shows the correlation among the dependent and independent variables. The correlation among all the variables has been tested by means of diagrams in the study. Thus, estimated independent variable values that are to be used in explaining the values of the dependent variables in the upcoming years have been obtained at the first stage. At the second stage, multiple linear regression analysis was use. Two alternative models have been exploited for the purpose of numbering the estimations. In the first alternative model, all the independent variables were integrated regardless of reliability. Also, in the second alternative model, the reliability, which is below 0.05, was integrated, and thus, the model was constituted. The result of two alternative models was presented, and the resulting difference in number was put forward. Finally, the resulting differences were evaluated to be whether neglected or not. The numeric data analyses have been carried out using the software SPSS.

3. Findings and discussion

The data between the years 1977 and 2017 have been analyzed through this method with the help of the software SPSS. The results, the formulas for each regression model, and R^2 values are given in **Table 2**. The coefficient for the variable "year" has been assumed as 1 for the initial year, which is 1977, and 54 for the year 2030. Therefore, a 54-year trend has been composed with the study.

As it can be seen in **Table 2**, except for the variable "afforestation rate," an increase trend is estimated for all variables. After estimating the possible future values of the independent variables, models related to the production amount of particle-fiber wood and fuelwood, which are dependent variables, have been formed using multiple linear regression modeling. Multiple linear regression modeling has been preferred because all variables show a linear relation. **Table 3** indicates not only the results of multiple linear regression analysis, which has been used to estimate the production amount of particle-fiber wood and fuelwood, but also the models obtained and the independent variable coefficients involved in the models.

When the values of the dependent variable "particle-fiber wood and fuelwood production amount" (Y_{1A}) in **Table 3** are observed, it can be understood that 94.4% of the dependent variable (Y_{1A1}) in Model 1 is explained by the independent variables involving in the model. The remaining 5.6% is explained by the variables that are not involved in the model due to the term "error." As for the second model, it is understood that 91.5% of the dependent variable (Y_{1A2}) is explained by the independent variables involving in the model, and the remaining rate is explained by the variables that are not involved in the model. In this case, it can be concluded that the variables picked for the model are highly effective. It is understood from the DW test scores that autocorrelation does not exist in estimating the particle-fiber wood production in the first and second models of which DW test scores are 0.961 and 0.441, respectively in **Table 3**. On the other hand, both the first model, where the modeling is significant at every level as a whole (F = 118.659/Sig = 0.000) and the second model (F = 133.369/Sig = 0.000) can be stated to be significant (Significance = Sig).

Years		Estimation of particle-fiber wood unit sale price ($USD/m^3)	Estimation of fuel wood unit sale price ($USD/m^3)	Estimation of afforestation (ha)	Estimation of population	Estimation of gross national product per person (GNP) ($USD)
	R^2	0.58	0.64	0.45	0.99	0.73
	Formula	X_{1A} = 0.6395×Year+15.24	X_{2A} = 0.4794×Year +7,7	X_{3A} = −0.3067×Year4 + 33.711×Year3– 1157.9×Year2 + 12,306×Year +37,985	X_{4A} = 986.603 × Year +4E+07	X_{5A} = 205.28 × Year +1427
2018 (42)		42.10	27.83	55,525	81,437,326	10,049
2019 (43)		42.74	28.31	57,900	82,423,929	10,254
2020 (44)		43.38	28.79	59,851	83,410,532	10,459
2021 (45)		44.02	29.27	61,261	84,397,135	10,665
2022 (46)		44.66	29.75	62,003	85,383,738	10,870
2023 (47)		45.30	30.23	61,945	86,370,341	11,075
2024 (48)		45.94	30.71	60,947	87,356,944	11,280
2025 (49)		46.58	31.19	58,862	88,343,547	11,486
2026 (50)		47.22	31.67	55,535	89,330,150	11,691
2027 (51)		47.85	32.15	50,804	90,316,753	11,896
2028 (52)		48.49	32.63	44,499	91,303,356	12,102
2029 (53)		49.13	33.11	36,444	92,289,959	12,307
2030 (54)		49.77	33.59	26,454	93,276,562	12,512

Table 2.
Estimated values of independent variables through regression modeling.

Dependent variables	(R^2)	*F*	Sig.	Durbin Watson (DW) test	Independent variables and parameters			
					Independent variables	Values	*t* Test	Sig.
First alternative model results								
Particle-fiber wood production (Y_{1A1})	0.94	118.65	0.00	0.961	Constant	−1,970,429.679	−2.449	0.019
					X_{1A}	−26,787.535	−0.996	0.326
					X_{2A}	−50,531.489	−1.179	0.246
					X_{3A}	10.652	3.387	0.002*
					X_{4A}	0.039	2.651	0.012*
					X_{5A}	575.574	10.385	0.000*
Fuel wood production (Y_{2A1})	0.96	172.49	0.00	1.062	Constant	48,623,723.470	27.881	0.000
					X_{1A}	−35,917.345	−0.642	0.525
					X_{2A}	−29036.430	−0.326	0.746
					X_{3A}	−17.267	−2.641	0.012*
					X_{4A}	−0.551	−18.719	0.000*
					X_{5A}	631.647	5.396	0.000*
Second alternative model results								
Particle-fiber wood production (Y_{1A2})	0.92	133.36	0.00	0.441	Constant	−2,832,784.647	−3.74	0.014
					X_{3A}	12.556	3.402	0.002
					X_{4A}	0.038	2.162	0.037
					X_{5A}	427.350	8.331	0.000
Fuel wood production (Y_{2A2})	0.96	274.20	0.00	0.758	Constant	49,774,524.600	27.881	0.000
					X_{3A}	−15.708	−2.641	0.012
					X_{4A}	−0.574	−18.719	0.000
					X_{5A}	492.363	5.396	0.000

**Statistically significant at ≤0.05.*

Table 3.
Projection modeling results related to particle-fiber wood and fuelwood production.

Two alternative models that have been formed according to the coefficients obtained from multiple linear regression analysis in order to estimate particle-fiber wood production are given in Eqs. (1) and (2) as follows:

$$Y_{1A1} = -1,970,429.679 - (26,787.535 \times X_{1A}) - (50,531.489 \times X_{2A}) + (10.652 \times X_{3A}) + (0.039 \times X_{4A}) + (575.574 \times X_{5A}) \quad (1)$$

$$Y_{1A2} = -2,832,784.647 + (12.556 \times X_{3A}) + (0.038 \times X_{4A}) + (427.350 \times X_{5A}) \quad (2)$$

With the help of the model formed, particle-fiber wood production average of Turkey has been estimated to be 6,657,294 m^3 for 2018 (average 1 and 2 models). According to the OGM [32] records, the production was 7,131,469 m^3 at the end of October 2018. When the estimated and actual production amounts are compared, a difference of 474,000 m^3 can be seen, which means an error margin of 6% meaning that the reliability of the projection has been proved with the rate of 94%. **Table 4**, on the other hand, indicates the estimated amounts covering the years between 2018 and 2030 by both of the alternative models and quantitative difference between the models.

Years	Y_{1A} (first model)	Y_{1A} (second model)	Difference between estimates (Y_{1A1}–Y_{1A2})	Estimates percentage error (%)
2018	7,056,371	6,258,217	798,154	11.31
2019	7,238,005	6,433,786	804,218	11.11
2020	7,415,121	6,604,032	811,090	10.94
2021	7,586,465	6,767,472	818,993	10.80
2022	7,750,702	6,922,535	828,167	10.69
2023	7,906,417	7,067,554	838,863	10.61
2024	8,052,121	7,200,771	851,350	10.57
2025	8,186,243	7,320,337	865,906	10.58
2026	8,307,135	7,424,307	882,828	10.63
2027	8,413,070	7,510,648	902,422	10.73
2028	8,502,244	7,577,231	925,013	10.88
2029	8,572,773	7,621,836	950,937	11.09
2030	8,622,694	7,642,150	980,544	11.37

Table 4.
The estimated amount of fiber-particle wood production 2018–2030.

On the other hand, when the dependent variable "fuelwood production amount" (Y_{2A}) is examined in **Table 3**, we come to the result that 96.1% of the dependent variable (Y_{2A1}) is explained by the independent variables involved in the first model. The remaining 8.5% is explained by the variables that are not involved in the model due to the term "error." As for the second model, it is understood that 95.7% of the dependent variable (Y_{2A2}) is explained by the independent variables involving in the model, and the remaining rate is explained by the variables that are not involved in the model. In this case, it can be concluded that the variables picked for the model are highly effective. As seen in the DW test scores, autocorrelation does not exist in estimating the fuelwood production in the first and second models of which DW test scores are 1.062 and 0.758, respectively in **Table 3**. On the other hand, both the first model, where the modeling is significant at every level as a whole (F = 172.491/Sig = 0.000) and the second model (F = 274.206 / Sig = 0.000) can be stated to be significant (Significance = Sig).

The models related to the projection of fuelwood production according to the coefficients obtained through multiple linear regression analysis are given in Eqs. (3) and (4) as follows:

$$\begin{aligned} Y_{2A1} = {} & 48,623,723.470 - (35,917.345 \times X_{1A}) - (29,036.430 \times X_{2A}) \\ & - (17.267 \times X_{3A}) - (0.551 \times X_{4A}) + (631.647 \times X_{5A}) \end{aligned} \quad (3)$$

$$Y_{2A2} = 49,774,524.600 - (15.708 \times X_{3A}) - (0.574 \times X_{4A}) + (492.363 \times X_{5A}) \quad (4)$$

With the help of the model formed, fuelwood production average of Turkey has been estimated to be 5,957,586 m^3 for 2018 (average 1 and 2 models). According to the OGM [32] records, the production was 5,866,939 m^3 at the end of October 2018. When the estimated and actual production amounts are compared, a difference of 90,647 m^3 can be seen, which means an error margin of 1.5% meaning that the reliability of the projection has been proved with the rate of 98.5%. **Table 5**, on the other hand, indicates the estimated amounts covering the years between 2018 and 2030 by both of the alternative models and quantitative difference between the models.

Years	Y_{2A1} (first model)	Y_{2A2} (second model)	Difference between estimates (Y_{2A1}–Y_{2A2})	Estimates percentage error (%)
2018	5,815,096	6,100,077	−284.982	−4.01
2019	5,302,710	5,577,000	−274.290	−4.15
2020	4,797,647	5,060,584	−262.937	−4.31
2021	4,301,941	4,552,681	−250.739	−4.46
2022	3,817,757	4,055,259	−237.501	−4.62
2023	3,347,385	3,570,402	−223.016	−4.77
2024	2,893,243	3,100,309	−207.066	−4.90
2025	2,457,874	2,647,295	−189.420	−4.99
2026	2,043,952	2,213,791	−169.839	−5.02
2027	1,654,274	1,802,342	−148.068	−4.95
2028	1,291,768	1,415,611	−123.844	−4.72
2029	959,485	1,056,376	−96.891	−4.24
2030	660,606	727,528	−66.922	−3.38

Table 5.
The estimated amount of firewood production 2018–2030.

According to the calculations by DPT [33] related to the energy and fuel required for production, 1.9 m^3 wood is required for the production of 1 m^3 particleboard. As stated in Section 1, in the event that the established capacity of the industry remains constant, approximately 10.2 million m^3 of wood per year shall be required for the production of 5.1 million m^3/year of particleboard. Similarly, according to the calculations by DPT in 2007, 1.2 m^3 wood is required for the production of fiberboard. Under the circumstance that fiberboard production capacity remains constant, approximately 8.2 million m^3 of wood per year shall be required for the production of 6.8 million m^3 per year, and the total need for wood shall be 18.4 million m^3 for a full-capacity production. When the capacity of the factories is kept at 80%, the amount shall be 14.7 million m^3. According to the projections made in the study, the possibility of meeting this amount under these conditions is not considered to be favorable. Because the average annual production is 11–12 million m^3 in the short term, whereas the long-term production decreases to 8–9 million m^3 following the decrease in fuelwood production.

4. Conclusion

In the light of findings obtained within the scope of the study, it has been clearly found out that the raw material supply for wood-based panel industry may turn into a problematic issue. Considering that the supply of raw material shall mainly be provided by the OGM, the raw material problem shall begin to increase within the next 20 years. Several studies carried out on the issue present similar conclusions ([4, 23, 34, 35]). At this point, the sectors where panel products are used are also of great importance. Construction sector and furniture industry are the leading ones among those sectors. Since the study focuses on raw material supply, the demands on a sectoral basis have not been discussed. The following suggestions, on the other hand, have been suggested as a result of the findings by approaching the board industry as a whole:

Raw material supply is one of the most important issues affecting the structural development of the sector. Therefore, demand projection should be made, and these projections should be revised on a yearly basis in order to provide the sector with a sustainable growth through accurate planning. Diversification of supply sources for balancing sectoral demand shall be the most important policy change as well. Considering the economic balances, not only the planning by the sector but also the involvement of the state, which holds 99.9% of the country's forest assets, in this planning shall be crucial. Besides, the state should increase the incentive opportunities.

Although the projection for raw material production does not point out any serious problems for the present but alarms for the possible ones in the future. Because the actual average production of particleboard and fiberboard is 11–12 million m^3 per year. The raw material demand for such a production is calculated to be 18 million m^3. While the current demand by the sector is hardly met, a greater bottleneck shall be created with a reduction in the fuelwood production amounts. From the point of view, in addition to the need to keep fuelwood production amount constant, it may be appropriate for OGM to focus on the production of wood that meeting the needs of the sector.

Another problem that Turkey might encounter in providing the sector with raw material is the fact that wood-based energy generation emerges with the energy agenda of the country. Particularly, the countries' tendency toward wood-based energy generation as an alternative way in order to provide the security of supply is likely to create a new kind of raw material bottleneck. The board industry, which has a slight chance of competing with the energy sector in raw material supply, is expected to encounter problems such as a shrink or capacity slow down. Moreover, the fact that energy forestry does not become widespread in the country seems to cast a shadow over the sector in the short term rather than the long term.

Based on the projections that sectoral demand shall increase and new conditions of competition shall occur, it is of great importance not only for the private sector but also for the state to engage in afforestation activities using fast-growing species, particularly around the factories with great production capacities.

As stated above, different alternatives or new policies may be identified for the solution of the raw material problem. One of these possible solutions might be the prioritization of the practices that are important to particularly meet the quantitative wood demands of the forest industry with a silvicultural technique. Here it is possible to consider the expansion of the afforestation using fast-growing species such as red pine or a reduction in the management period.

Another important policy might be the designation of areas for the production of wood within the framework of functional planning, implementation of these plans, and reviewing the forest management plans. At this point, a policy to be followed might be the expanding the forestlands designated for wood production.

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