An Analysis of the Demand Market of Indonesian Plywood in Japan

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Abstract

The Indonesian plywood industry began to rapidly develop in the 1980s, since the government stated a new policy regarding a ban on the export of wood logs in 1985. The industry has experienced rapid growth and structural change and played an important part in the Indonesian economy through a significant role as a gross domestic product, foreign exchange, government revenue, and employment contributor. The aims of this study are to analyze the current situation of Indonesian plywood consumption and to estimate the demand market of Indonesian plywood for the next five years in Japan. For the purposes of the study, data of the export of Indonesian plywood to sixteen countries over five years (2008-2012) and data of plywood exported to Japan over thirty one years (1982-2012) was collected. To predict demand market of Indonesian plywood in Japan, the obtained data was analyzed by using an exponential smoothing model. Mean Absolute Percentage Error, Mean Squared Error and Mean Absolute Deviation are also used to calculate demand sales forecast accuracy. The results indicated that the future market of Indonesian plywood in Japan will remain fairly constant at the level of 1.09 million m³ in 2013 until 2017. Japan is still the dominant market for Indonesian plywood.

Keywords: *plywood; demand; market.*

Abbreviations:

ITTO	:	International Tropical Timber Organization
MAPE	:	Mean Absolute Percentage Error
MSE	:	Mean Squared Error
MAD	:	Mean Absolute Deviation
SES	:	Single Exponential Smoothing

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1. Introduction

Plywood has been the dominant wood industry product in Indonesia, since the government stated a new policy regarding an export ban of wood and logs in 1985 [1] and the government issued a policy requiring every forest concessionaire to establish a wood-processing plant [2].

The policy made Indonesia one of the biggest plywood suppliers in the world [3], supplying about 70% of the total global market [4]. The government policy encouraged the growth of domestic wood industries, mainly the plywood industry, which was initially only three companies, which increased to 101 companies by 1980. It further increased by 1987 to 118 companies, and in 1992 the number of companies reached 120 [5].

The log export ban ensured a cheap source of raw materials, and an export marketing cartel aggressively pursued overseas markets. Approximately 90% of Indonesia's plywood production is consumed in the global market, and the rest in domestic markets [1]. The industry is the dominant exporter of plywood in the world. It is also the greatest user of industrial logs from tropical rain forests, and so, is paid close attention by conservation interests. The industry was developed to add value to raw materials, to aid industrialization, and to provide employment [6]. Besides, the positive effects of a log export banning policy are improving the foreign currency through forest product exports, expanding the labor market, increasing individual and regional income and enhancing forest development growth [7]. In the labor sector, total employment in wood and wood product industries has increased from roughly 42.000 in 1975 to 562.000 just before the economic crisis before declining to 392.000 in 2000 [8]. Until 1997, the plywood industry's export earnings dominated the sector, with a production level twice the volume of the world's second-largest producer of tropical plywood [1]. Indonesia exports plywood primarily to Japan, China, and the Republic of Korea, although the proportion of its exports shipped to these countries has dropped since 1992, due to increased exports to the US and the European Union [9].

The rapid growth of the Indonesian plywood industry increased pressure on forests, leading the government to declare the plywood industry closed to new investments and to introduce tighter controls on forest exploitation (10).In fact, growth in the plywood industry came at a cost. Domestic log production tapered off and domestic log prices fell relative to world price throughout the 1980s and 1990s [11].

On the other hand, the rapid industrial growth, particularly in the plywood industry, has created a spatial imbalance of supply and demand for logs as a raw material [12]. The expansion of this industry has decreased in line with the decline in log production from natural forests, while, at the same time the production of logs from

plantation forests has not been able to replace it. The direct impact due to the deficit of raw materials has meant a decrease in wood related industrial capacity, especially in the plywood industry which has declined from 99% in 2007 to 42% in 2005[13]. Furthermore, the production has declined to 3.1 million m³ in the year 2008, a drop of 27% compared to 2007 [14].

In 2007, Japan was the number one market for Indonesian plywood, importing a value of US$ 618.5 million, while the United States was the second largest market with a value of US$ 112.4 million [5]. Although Indonesia's exports have plunged from the record highs of around 10 million m³ (or 85% of total ITTO producer exports) in the early 1990s, a recovery took place in 2010 from a record low in 2009, increasing 29% to 2.5 million m³. Indonesia's exports were mainly to Japan (37%), Taiwan ROC (10%), China (9%), the USA (7%) and the Republic of Korea (5%). Indonesia and Malaysia accounted for 91% of ITTO producer country exports of tropical plywood [15].

In order to fulfill the future market for Indonesian plywood in Japan, estimates or forecast of the demand market for plywood products was investigated. Forecasting is an important strategic planning tool for businesses and companies [16], and it is the art of anticipating what buyers are likely to do under a given set of conditions [17]. The reason that forecasting is so important is that prediction of future events is a critical input into many types of planning and decision making processes. Forecast of sales response to advertising expenditures, new promotions, or changes in pricing policies enable businesses to evaluate their effectiveness, determine whether goals are being met, and make adjustments [18].

By knowing the demand market of Indonesian plywood product, the number of plywood products which will be in production can also be estimated. Thus, logs as the main raw material in the manufacture of plywood can be prepared to anticipate the sustainability of production processes. Due to this, Indonesian plywood industry will again be the biggest suppliers, not only in the Japanese market, but also in the global market.

2. Methodology

2.1 Data

The monthly reports of Indonesian plywood exported to Japan in quantity (m³) from 1982–2012 recalculated into annual reports is used to predict the demand market of Indonesian plywood in Japan for the next five years. To analyze the current situation of Indonesian plywood consumption around the world, export data of Indonesian plywood over five years (2008-2012) to sixteen countries is also used in this study. This data was taken from the monthly reports on the export of plywood, as prepared by the Indonesian Forest Industry Revitalization Body (BRIK-

Badan Revitalisasi Industri Kehutanan). Time series data of log production, plywood production, and the number of existing plywood industries in Indonesia were taken from the Ministry of Forestry, Forestry Statistics of Indonesia in various years. Data for the demand for plywood in Japan was taken from the Forestry Agency, Ministry of Agriculture, Forestry and Fisheries (Japan), and was also calculated to support this research.

2.2 Data analysis

In order to find out the potential market for Indonesian plywood, data analysis is done periodically (time series data) by using single exponential smoothing method (SES). The SES is still a widely used method in different computer systems and forecasting programs [19] and should be used when the time series data has no trend and no seasonality [20]. The method of SES takes the forecast the previous period and adjusts it using the forecast error [21]. This method proposes that the historical data of the value of plywood indicated the model can be used for forecasting. Mean Absolute Percentage Error (MAPE), Mean Squared Error (MSE) and Mean Absolute Deviation (MAD) are also used to calculate demand sales forecast accuracy. A SES, which produces an i-period-ahead forecast at time t (St) [22], can be calculated recursively, as follows:

$$S_t = \alpha X_t + (1-\alpha)S_{t-1}, = S_{t-1} + \alpha e_t, \dot{X}_t(m) = S_t, 0 \square \alpha \square 1, i \geq 1 \quad (1)$$

where: S_t = SES forecast of time t; X_t = Observed value of the time series in period t, $X_t(m)$= Forecast for m periods ahead from origin t, α = smoothing coefficient

When α is close to one, the new forecast would be equal to the previous forecast and a substantial proportion of the most recent forecast error; however, whenever the α value is close to zero, the new forecast would be equal to the previous forecast with little influence from the most recent forecast error [23].In order to measure the effectiveness of the future market, it is necessary to measure the forecast accuracy. Accurate forecasts are crucial to good revenue management [24]. The forecast accuracy, MAPE, MSE and MAD are measured by the formula [25]:

$$MAPE = \sum_{t=1}^{n} \frac{|PEt|}{n} \quad (2)$$

$$MSE = \frac{1}{n}\sum_{t=1}^{n} (y_t - t)^2 \quad (3)$$

$$MAD = \frac{1}{n}\sum_{t=1}^{n}|e_t| \quad (4)$$

where:
PE = Percentage Error
n = Number of units
yt = Actual value index
ỹt = Forecast value index
t = Period at time t

Table 1 shows the statistical error measurements for the forecast accuracy of MAPE, MSE and MAD to predict the demand market of Indonesian plywood to Japan by using an α value of between 0.1, and 0.9. The smaller the forecast error, the more accurate the forecasting method. Of all assessed coefficients of α , the smallest estimated MAPE, MSE, and MAD occur at α=0.9. It follows that the main coefficient to forecast the demand market of the Indonesian plywood in Japan is using α=0.9.

Table 1 Statistical error measurements for the MAPE, MSE and MAD method for different α values

|	Smoothing coefficient alfa (m3)		
Alfa	**MAPE**	**MSE**	**MAD**
0.1	36.95	9,620,917,265.15	720,839.47
0.3	19.78	437,476,939.17	327,903.96
0.5	9.69	291,837,714.47	147,120.62
0.7	6.23	403,872,051.02	97,943.62
0.9	2.12	3,965,666.75	34,724.88

3 Results and Discussion

3.1 Current situation of Indonesian plywood consumption

Indonesian plywood consumption to sixteen countries over the period 2008-2012 is shown in Figure 1. Major importer countries were Japan, China, Saudi Arabia, Taiwan and Korea, which together accounted for 80% (11.8 million m³) of Indonesia's plywood export. Other countries contribute only 3.08 million m³ of the total Indonesian plywood consumption.
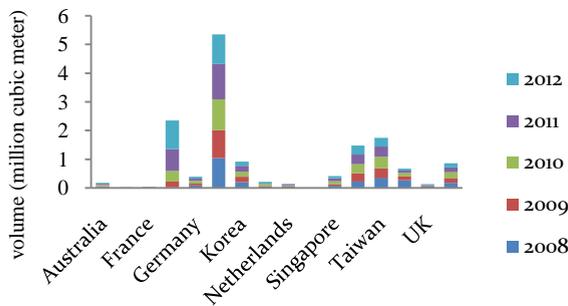
Figure 1 Indonesian plywood consumption over the period 2008-2012

During the period 2008-2012, Indonesian plywood consumption to sixteen countries significantly increased from 2.6 million m³ in 2008 to 3.3 million m³ in 2012, a 21.25% increase. Over this period, Japan was the largest consumer of Indonesian plywood with a volume of 5.35 million m3 or 1.07 million m³ on average. Alternatively, New Zealand contributes only 0.03% (4.485 m³). The five main importer countries of Indonesia's plywood are shown in Figure 2.
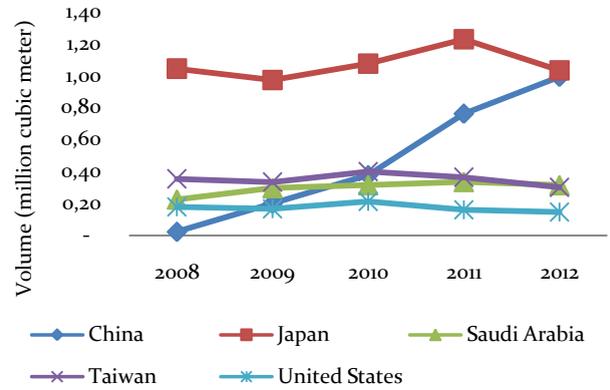
**Figure 2** Major importers of Indonesia's plywood over the period 2008-2012

Over the period 2008-2012, Japan is the number one market for Indonesian plywood accounted for 38% of total Indonesian plywood exports. In 2012, Japan is still a dominant consumer of Indonesian plywood, importing a volume of 1.03 million m³, while China was the second market accounting for 0.99 million m³. However, over this period, plywood exports to Japan decreased from 1.23 million m³ in 2011 to 1.03 million m³ in 2012, a decrease of 16.2%. In contrast, China as the second largest importer of Indonesian plywood significantly increased between the years 2008 and 2012 importing a volume of 0.02 million m³ in 2008 rising to 0.99 million m³ in 2012.

However, over recent years, a slight decline in Indonesia's exports to other major importers has been matched by a reduction in Indonesia's log production from natural production forests. Plywood and log production based on the source of production over the period 2004-2011 is shown in Figure 3. The total timber production in 2012 was 47.4 million m³, 5.6 million m³ of which originated from natural forests, while the production of logs from plantation forest using fast growing hardwood species at the same time has increased. The increasing harvest volume from plantation forests and community forests has influenced pulpwood production.

3.2 Trends of Plywood Exported to Japan during 1982-2012

The amount of plywood exported to Japan between the years 1982 and 2012 totaled about 59.1 million m³ or 1.9 million m³ on average. The trend of Indonesian plywood export to Japan for thirty one years (1982-2012) is shown in Figure 4. During the period 1982-1989, Japan plywood consumption significantly increased from 49.933 m³ in the year 1982 to 3.2 million m³ in the year 1989. Since the mid-1980s, plywood has been the dominant wood product industry in Indonesia. The log export ban ensured a cheap

source of raw materials, and an export marketing cartel aggressively pursued overseas markets. However, during the period 1989-1992, Japanese plywood consumption decreased from 3.2 million m³ in the year 1989 to 2.7 million m³ in the year 1992.
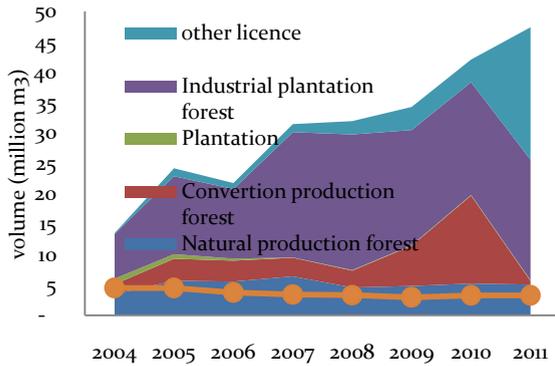

Figure 3 Plywood and log production based on the source of production, 2004-2011
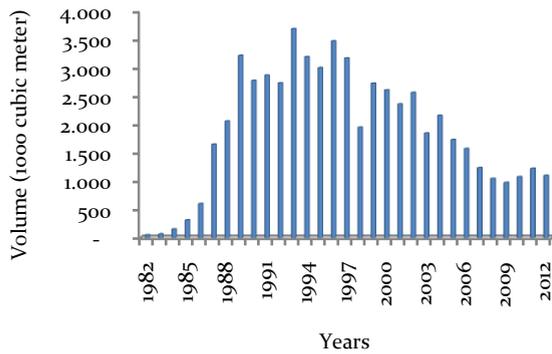
Figure 4 Trends of Indonesian plywood export to Japan from 1982-2012

Indonesian plywood exports to Japan continued to decline since the monetary crisis in mid-1997. At the same time, the number of Indonesian plywood industries has significantly decreased from 120 companies in 1997 to only 50 companies in 2011 as shown in Figure 5. The decline of Indonesian plywood exports was partly caused by the fact that a number of East Asian countries were troubled by an economic recession, which cut the activity of the property/construction sector. Another reason for the fall-off in export performance was the growing penetration into the international market of cheaper substitutes for plywood such as softwood and MDF (medium-density board). Moreover, the decreasing of the number of Indonesian plywood industries has been affected by shrinking log

availability from natural forests due to overexploitation of forests in previous years and declining availability of logs of peeler quality and improvements in law enforcement.
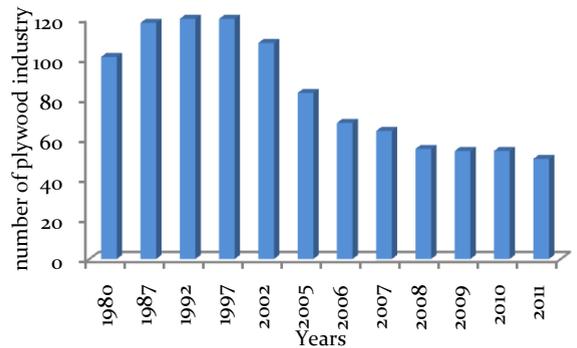
Figure 5 The number of plywood industries in Indonesia, between 1980 and 2011

The amount of plywood exports to Japan over five years (2008-2012) totaled 1.03 million m³ worth at US$ 3.1 billion m³. Over this period, the amount of plywood exports to Japan slightly increased from 1.04 million m³ in 2008 to 1.22 million m³ in 2011. During this period, Japan was in urgent need of pre-fabricated houses and manufactured wood products, especially plywood in the after math of the tsunami.

In the Japanese market, Indonesia was the second largest supplier of plywood since 2007. The largest supplier to the country was Malaysia. Other main suppliers were China, New Zealand, the Philippines, Taiwan, Canada, Finland, Russia and Thailand [26]. Furthermore, Japan Wood Products Price, 2011 [27] reported that in 2010, the supply of plywood in Japan was 5.8 million m³, up 12.9% from the level recorded in 2009. The major supplier countries of plywood in Japan in 2010 were Malaysia (47.9%), Indonesia (29.0%), China (19.2), and New Zealand (2.5%).Furthermore, in Japan, over the period 2007-2011, the total plywood demand (see Figure 6) was 49.81 million m³ or 9.96 million m³ on average, with plywood imports accounting for 78.4 % and 21.6% from domestic supply.
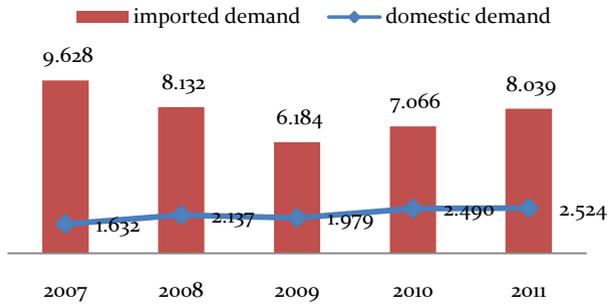
Figure 6 Plywood demand in Japan (volume, 1000 cubic meter), 2007-2011

3.3 Future market of Indonesian Plywood in Japan

The amount of demand for Indonesian plywood for the next five years in Japan was calculated using SES. The result indicated that Japan is still the dominant market for Indonesian plywood exports. Figure 7 shows that the export of Indonesian plywood to Japan is predicted to be relatively stable at around 1.09 million m^3 in 2013, continuing until 2017.
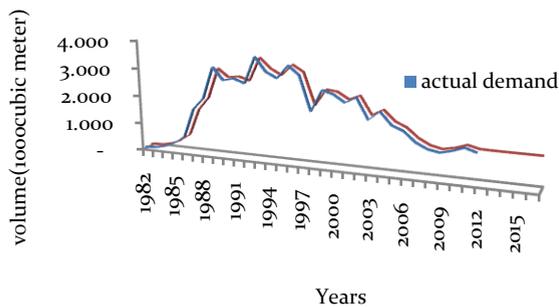

Figure 7 Forecast demand market of Indonesian plywood in Japan

Indonesian plywood exports in the global market will significantly increase from 3.5 million m^3 in 2014 to 4.0 million m^3 in 2015 [28]. It follows that Japan will contribute 31% and 27% in 2014 and 2015 respectively from the total of Indonesian plywood exports. In the global market, according to a new report by Global Industry Analysts [29], the demand for plywood products is forecast to reach 75.9 million m^3 by the year 2015. From the total export of Indonesia plywood, Indonesia will have a share of 5.3% or 4 million m^3 of the world's plywood supply in 2015.

4 Conclusion

Indonesian plywood supply to sixteen countries significantly increased from 2.6 million m^3 in 2008 to 3.3 million m^3 in 2012, a 21.25% increase. Major importer countries were Japan, China, Saudi Arabia, Taiwan and Korea which together accounted for 80% of Indonesian plywood exports. Japan as the number one market for Indonesian plywood accounted for 38% of the total Indonesian plywood exports. Demand market for Indonesian plywood in Japan is predicted to remain relatively stable at around 1.09 million m^3 in 2013 until 2017.

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