Supply Chain Management of the Plywood Industry in Indonesia

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Abstract. The plywood industry in Indonesia experienced a heyday in the 1980s and experienced ups and downs in the following year. One of the causes of the decline in plywood production in several industries is the supply chain management of raw materials. This study aims to determine supply chain mechanisms related to the flow of product, flow of financial and flow of information at the plywood industry in South Sulawesi. Data collection techniques are carried out with initial observations, field surveys, interviews, and literature studies. Data analysis was performed using qualitative and quantitative descriptive analysis. The results show that the supply chain in plywood mills has a fairly complex link starting from product flow, financial flow and information flow related to raw material supply, inventory and sales. This company needs to implement an integrated supply chain management to help maintain the sustainability of plywood production so as to increase the company's performance.

1. Introduction

Industry is an economic activity processing of raw materials, semi-finished goods into goods that will have a higher added value. Based on the classification of its productivity, the industry can be classified into producing goods and services. One of the producer industries is plywood industry [1]. Plywood has been the popular of Indonesia's processed wood industry products for several years. The highest export figures ever achieved in 1992 accounting to 9.7 million m³ [2]. Plywood is the superior product in increasing national revenues, caused by production and exports experienced a rapid increase. Before the crisis period, plywood and other processed wood was the prime of non-oil exports, caused by the export value has increased every year [3].

The plywood industry experienced rapid growth during the period 1980-1997. This was related to the issuance of the Joint Decree of the Three Ministers (Agriculture, Ministry of Agriculture, and Trade) related to the ban on exporting of logs which is done gradually. The government effort to create added value of export wood product through to ban of log export is the government's anticipatory step in preventing there was a decline in foreign exchange due to the decline in world oil prices at the time. This has caused the coating industry developed a rapid growth [4]. However, the rate of Plywood production showed a downtrend with fluctuation. The number
of plywood production in 2014, 2015, 2016 was at 3,579,113 m³; 3,640,631 m³ and 3,636,058 m³ respectively [5].

One of the reasons for declining plywood production was the lack of logs raw materials [6]. Based on the above, this can result in a lack of availability in terms of raw materials. Inventory is one of the important stimulus supply chain due to changes in inventory policy can drastically change the level of responsiveness and supply chain efficiency [7]. The reduced production capacity of this plywood industry is one of them caused by inefficient supply chain management arrangements. Efficient supply chain management can be achieved if the management and supervision of distribution channel relationships was carried out cooperatively by all parties involved. The form of supply chain regulation really needs special attention [8].

Nowadays, supply chain management is no longer considered a new thing for the company. Many companies have implemented supply chain management in their business to increase the efficiency of the company's logistics process [9]. Supply chain is a concept where there are regulatory systems relating to product flow, information flow and financial information [10]. This flow is very important to identify related to the many aspects or elements in the supply chain in order to maintain product quality and availability. This study focuses on the flows in the supply chain including product flow, information flow, and financial flows in one of the plywood companies in South Sulawesi, Indonesia.

2. Research Methods

2.1. Study Site
PT. KTC is located in Makassar City, it is one of the largest plywood companies in South Sulawesi. The consideration of choosing Makassar as the location of the plywood factory because of the availability of cheap labor, the port transportation is quite good and easy, and the transportation lines of the factory are quite cheap and smooth. In line with the times and technology in terms of production, PT. KTC has conducted a comprehensive restructuring in 2004, both related to production machinery and human resources by conducting employee training programs. To deal with market dynamics, PT. KTC strives to maintain a brand image that is already well known in the international market as well as through the improvement of product and service quality in punctuality. Improving the quality of production and service is supported by the improvement of skills and work capabilities of employees through continuous education and training both internally and externally. At present the number of employees working at PT. Katingan Timber Celebes is 1,578 people, consisting of 729 men and 849 women.

2.2. Data collection methodology and data analysis
Data collection techniques were carried out through initial observation, field surveys, interviews and literature studies. The initial observation was the activity carried out with introduction of the location of the research which is to find out the state of PT. KTC based on information from various sources, especially from research results. Field surveys are conducted by visiting companies ranging from unloading, log pond, log yard, processing of raw materials and products, packaging, warehouses, and administration section. In addition, in-depth interviews conducted with informants in each unit of work are the production planning inventory control (PPIC) responsible for managing the inventory of raw materials, the purchasing that is in charge of the procurement of raw material preparation for the company's needs, production sector that is in charge of carrying out production activities and
supervising the quality of products and marketing section is responsible for generating revenue for the company by selling the company's products. Literature studies are conducted with research literature reviewers, journals, and reports related to research.

Data analysis was carried out by qualitative and quantitative descriptive analysis. Qualitative descriptive analysis is carried out to describe the relationship between supply chains starting from procurement, raw materials, production processes, distribution and marketing of plywood products, especially those related to the flow of products, information and finance. Quantitative descriptive analysis was carried out to calculate round wood supply starting from the initial inventory, obtaining raw materials, using raw materials and ending supplies of logs.

3. RESULTS

3.1 Supply Chain in Plywood Industry PT. KTC
Flow patterns in the plywood supply chain at PT. KTC (Figure 1) shows that there are three streams in the pattern divided into product flow, financial flow and information flow. The product flow begins from upstream to downstream, from the source of logs raw materials to consumers. The financial flow flows from downstream to upstream, that is, from consumers of plywood to source of logs while Information flow flows in the chain reciprocally.
Figure 1. Plywood Supply Chain at PT. Katingan Timber Celebes
3.1.1. Flow of Product

The product flow starts from the sources of logs raw material, the production process of plywood until the plywood products are marketed to consumers. Logs raw material obtained originating from forest concession (own concession and other concession). The raw material obtained from own concession comes from PT. Gema Hutani Lestari, PT. Gorontalo Citra Lestari, and PT. Gorontalo Nusantara Jaya. Whereas other concession comes from PT. Nusaina Agro Tanah Merah Manise, PT. Dewata Wana Lestari, and PT. Wijaya Kencana.

Logs raw material which is from forest concession are placed in the Tallo River Estuary, which is an anchorage and unloading point for 4-5 days and then withdrawn to a log yard. The unloading point of the Tallo River estuary is only a place for unloading logs, not a place to collect or store logs, there is any facility to the port. Every day when unloading logs is immediately withdrawn to the log pond on the Tallo River. Logs that have been dismantled into the sea will be pulled to log pond 1 using a tug boat. Next from log pond 1, the wood is taken to log ponds 2, 3, and 4. Log pond 4 is the last log pond and is located at the area of the PT. KTC.

The production of plywood carried out through several sections at the start of the log handling, veneer reeling, veneer drying, veneer clipper, veneer jointing, glue spreading, pressing, grading, and packing. Furthermore plywood products then distributed to the main market, it is export markets.

3.1.2. Flow of Finance

Financial flow is a flow from downstream to upstream. Financial flows, begins from consumers to sources of raw materials. The financial flow referred to relates the system of purchasing, delivery, and selling the plywood. Buyers from abroad who want to buy plywood product purchasing with delivery order system. Delivery order is an activity to send product with the stages of starting the order of goods until the goods arrive at the customer with a Standard Operating Procedure that has been made and determined by a company with the policies of each company. As for product shipping costs, PT. KTC uses the Cost and Freight system where product transportation costs are borne by company. The company reaches the nearest port to the buyer. This fee includes insurance, taxes and other fees for removing goods from the port ware house. The selling prices of plywood products vary depending on the countries are of interest. The price of plywood products is exported to Japan and Taiwan, is $ 600/m³, while the European countries and the United Kingdom respectively are $ 750 /m³ and $ 900 /m³.

3.1.3. Flow of Information

Information flow is a flow that occurs both from upstream to downstream and from downstream to upstream. Information flow in the supply chain is related to the system of procurement of raw materials, the amount of raw material inventory, the amount of logs used, marketing, as well as the number of products exported and which are marketed locally. The process of procuring logs is handled by the log supply section. Procurement of logs is carried out using a contract system and is carried out after knowing a number of raw material requirements for production. The purchasing system uses a one price system, which is party purchases where the logs for one party are the same price and no longer pay attention to the type of logs purchased. If the inventory level dropped to the level of 9309.42 m³ then the company needed to reorder [11]. Log orders made with the Reorder Point Approach are anticipated to avoid shortages and excess logs.

Furthermore, the company also actively explores cooperation with a number of forest concession and other suppliers who are considered capable of providing raw materials in order to ensure the continuity of production and avoid the occurrence of shortages of raw material inventories. In the process, the company will send a grader to check the quality and quantity of logs owned by the forest concession. If the logs inspected are deemed feasible, then the agreement of the contract agreement is immediately carried out by both parties, which in turn the supplier supplies logs for a certain period of time.
The fulfillment of logs at PT. KTC comes from natural wood and plantation wood. Figure 2 showed that the fulfillment of raw materials from natural wood decreased dramatically, accounted 605,623.5 m³ in 2014 to 47,120.56 m³ in 2016. However, in 2017 the fulfillment of raw materials from natural wood increased by 38,629.63 m³ from the previous year or by 45%. Fulfillment of raw materials from wood experienced a very significant increase from 2014 and 2015 which was at 33,67 m³ and 668,96 m³ respectively. However, in 2016 until 2017 the raw materials of plantation wood continued to decline from 302,25 m³ to 134,37 m³.

![Figure 2. Fulfillment of Raw Materials for 2014-2017 (m³)](image)

Information flow discusses the number of round logs. Figure 3 shows that the use of logs in 2014 amounted to 100,526.89 m³ and continued to decline until 2016 until the use of logs was 47,785.81 m³. However, the use of round wood increased by 43.32% from the previous year. The use of logs from plantation forest has increased significantly from 40.53 m³ in 2014 to that of 668.96 m³ in 2015. However, in 2016 to 2017 the use of logs fell down from 328.05 m³ to 134.37 m³. The comparison of the use of logs from the raw materials of natural wood and plants in 2014-2017 (m³) can be seen in Figure 3.

![Figure 3. Use of logs raw material in 2014-2017 (m³)](image)

Other information flows related to marketing plywood products. The marketing activity of plywood products at this company is handled by the marketing section. The numbers of employees in the marketing department are 20 persons. The negotiation with customers in terms of the number of requests and prices was handled directly by the marketing section at the head office in Jakarta. 94.5% of plywood products intended for export market to countries such as Japan, Europe, Taiwan and the UK and the rest for local market (5.5%) intended for Jakarta and Medan. To distinguish the results of plywood products produced by the company with other products, PT. KTC uses the Indonesian KTC-UP trademark for exports market. In general, plywood products marketed by PT. KTC to exports based on Japan Agriculture Standard (JAS), International Hardwood Product Association (IHPA) standards and EURO (Europe) standards.

Figure 4 shows that in 2014, the total export of plywood products was 45,050.24 m³ and continued to decline in 2016 of 18,321.16 m³. However, plywood exports increased significantly by 26,190.34 m³ in
2017. In addition, for the local market, the plywood continued to decline for three years in 2014 to 2016. However, there was a significant increase in 2017 accounted 2,284.6 m³ from 1,380.68 m³ in 2016.

![Figure 4. Export and local market of plywood in 2014 - 2017 (m³)](image)

Based on the data of the fulfillment of raw materials, the use of logs, and the selling of plywood, it can be seen that the fluctuations tend to decline in production and selling of plywood products. This is due to the lack of supplies of raw materials for logs. One of the factors that caused this was due to slow delivery of raw materials caused by weather factors. The largest supplier of logs is from PT. Gema Hutani Lestari in its annual period has many rainy months.

4. Conclusion

The flow of product flows from upstream to downstream, supplies raw materials, production processes and marketing. The source of raw materials comes from forest concessions. The financial flow is related to the system of buying and shipping plywood products, and the selling price of plywood. The system for purchasing of plywood is to use a delivery order system based on mutual agreement between producers and consumers. As for product shipping costs, PT. KTC uses the Cost and Freight system. For sale prices, PT. KTC applies different selling prices for each destination country. The flow of information flowing in the supply chain of PT. KTC is related to the system for the procurement of raw materials, the amount of raw material inventory, the amount of logs used, marketing, and how many products are exported and which are marketed locally. The system for procurement of logs is carried out under a contract system. The amount of raw material inventory until 2017 is 85,884.56 m³ while the number of usage until 2017 is 36,190.34 m³. For marketing activities, PT. KTC exports more plywood with 2017 exports of 36,190.34 m³, while domestic is only 2,284.60 m³.

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