Performance Management in Crude Palm Oil Industry using Analytical Hierarchy Process

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Abstract: Decision making has become a routine activities carried out by the production manager at Palm oil mill company. One of the problems that will arise is the decline in production quantity. Therefore, this study intended to help the company to determine the optimal amount of crude palm oil production and to determine the order of priority factors influencing the decline in production quantity and also apply the Analytical Hierarchy Process (AHP) method in the production planning the company to assist and facilitate the decision-makers in making decisions. The data input obtained from documentation like inventory, demand and production data. In addition, AHP also is a method for decision making and the data obtained from interviews and questionnaire. The results of this study is the total production and inventories of crude palm oil by the year 2014 turned into optimal and stable; profit is higher than previously; then, the plot data also showed that the total production in 2014 is not stable because there are still decreased. Then the main factors affecting the decline of total production is internal factors. The order of priority of the internal factors is factor capital, labor, raw materials and technology and machines.

Key words: Fuzzy logic, decision making, production, planning, crude palm oil, AHP

INTRODUCTION

Now a days, the company of manufactures act in the environment and unpredictable of a competitive market. Products and production technology is changing rapidly, causing a period of time between new product innovation becomes shorter. The increasing market demands in line with the growth of new variations of product with higher complexity (Nachtwey *et al.*, 2009). To stay competitive, companies have to quickly adapt to market changes. Using the newest technology and production facilities are needed. This new situation requires a higher production planning frequency and planning methods adapted for design of production system (Nachtwey *et al.*, 2009). Determination of the optimal number of production became one of the key to realizing a successful production planning. This relates to the level of success of the company to meet consumer demand. Every company hopes to avoid shortages and excess of their output. If the output is less then it can result in the loss of opportunity to sell the products in accordance with customer demands and reduced customer trust. Meanwhile if the result of a production is excessive, it will result in increased inventory costs.

Literature review: Crude palm oil industry is the manufacturing industry that requires precise and accurate decisions in production planning. Previously, we have seen that the crude palm oil industry is an increasingly rapid growth in Malaysia, this is in line with the increasing market demand. Ever-increasing demands made CPO firms have to work hard to fulfil that demand, meanwhile the constraints always come over to this industry. Now a days, the world palm oil market conditions for global usage had reached 50 million tons which has been increasing since 1990 until now. This success can be achieved because palm oil is more profitable than other vegetable oils (WWF, 2012). Palm oil prices were lower compared to other vegetable oil therefore, palm oil provides a competitive advantage in user countries like India and China. Among the 17 oils and fats in the global market, palm oil is the most consumed oil in 2012, reaching 3 billion people in 150 countries with a total consumption of 52.1 million tonnes (Fig. 1).

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Table 1: Total production of crude palm oil Malaysia (MPOB 2012 and 2013)

Years	Procuction (tonnes)	Land area (ha)
1975	1,257,573	641.791
1980	2,573,173	1,023,306
1985	4,134,463	1,482,399
1990	6,094,622	2,029,464
1995	7,810,546	2,540,087
2000	10,842,095	3,376,664
2005	14,961,654	4,051,374
2010	16,993,717	4,853,766
2011	18,911,139	5,000,109
2012	18,785,139	5,037,959
2013	19,216,459	5,230,000

Table 2: Total stocks, prices and export of crude palm oil Malaysia (MPOB 2012 and 2013)

Years	Stocks (tonnes)	Prices (RM)	Eksport (tonnes)
2010	710.541	2.701	23,060,017
2011	1,066,291	3.219	24,271,672
2012	1,575,103	2.764	24,591,025
2013	1,118,531	2.371	25,702,707

oil companies should do proper planning so that production can be productive and be able to meet market demand.
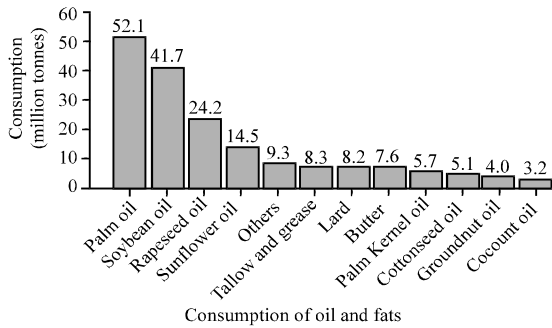

Fig. 1: Global consumption of oil and fats 2012 (total = 183.9 million tonnes) (SDP, 2013)

Consuming countries of the world's tallest palm oil are China, India, Indonesia and the European Union (SDP, 2013).

Furthermore, according to REA Holding analysis on their website "the world consumption of oils and fats has grown steadily during the last 26 years. The oil world statistics indicate that consumption in the last six years has increased from a level of some 162 million tonnes in 2008 to 195.6 million tonnes in 2014". Therefore, Malaysia must increase the production for fulfilling the market demand. Moreover, according to Mielke (2011), oil palm along with other vegetable oils will continue to face the increased global demand from the food industry, oleo chemicals and biofuel industries. Mielke (2011) predicts in 2015 the demand for palm oil is around 62.63 million tonnes.

Based on the MPOB report the production and export of Malaysian crude palm oil in 2013 is increased. But in 2012, the production decreased 2.3%. Meanwhile, the number of stocks from 2010 until 2013 remains high. In 2013 the price decreased quite low but the total stock remained high (Table 1 and 2). This can lead to a build-up of inventory in the warehouses and will result in a decrease in the amount of production. To avoid a decrease in the production of crude palm oil, crude palm

MATERIALS AND METHODS

AHP methods are the first method developed by Thomas L. Saaty in 1970's (POC, 2013). This method is a multi-criteria decision making model that can help the human frame which factors logic, experience, knowledge, emotions and sense optimised in a systematic process (Shean, 2012). AHP method is used to solve complex problems in which aspects or criteria taken quite a lot, this complexity is caused by many things including the unclear structure of the problem, uncertainty perception of decision making as well as the uncertainty of the availability of accurate statistical data. Sometimes problems arise perceived and observed to be decided as soon as possible but complicated variations, so that the data cannot be recorded numerically (quantitatively) but qualitatively which is based on perception, experience and intuition (Nurbismo, 2010).

Data analysis: The overall result calculations use the Software Expert Choice 11, then the results obtained by internal factor is better with the amount of the percentage of 73.8% (Fig. 2). Internal factors that most influence is the capital factor. As for the order of 1-3 priority factors that most influence the amount of crude palm oil production at sindora palm oil mill is good production time with a value 0.233 or 23.3%. The second factor is the factor delivery time with the value 0.109 or 10.9%. The third factor is the quality factor in workers with 0.103 or 10.3%.

Good production time becomes a major factor for the company sindora palm oil mill, goods production time is a difficult problem to be solved. Required scheduling technique and a good strategy to solve the problem on this factor. Then the next factor is the delivery time factors (special material). This factor also often causes problems such as delays in raw materials to the factory and the quality factor of the workers that also gives considerable cause for the decrease in the amount of production. The third factors are the main factor that directly will
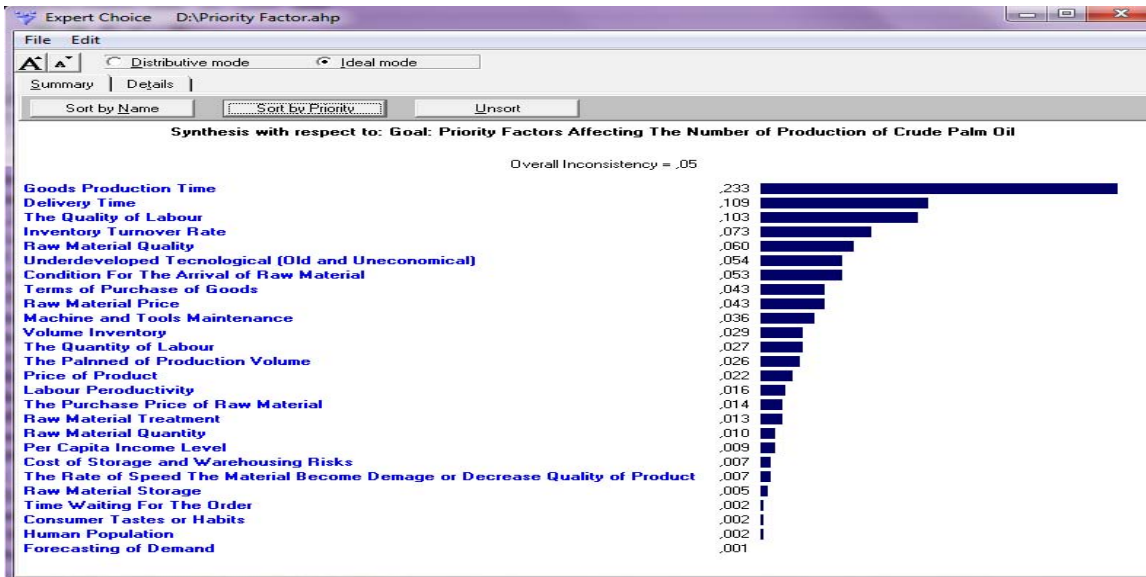
Fig. 2: The overall order of priority factors for achieving the goal

give effect on the decrease in production at the sindora palm oil mill and the production decision makers need to consider and prioritize the production of these factors to be analysed and resolved if a problem occurs. The order of factors can further be seen in Fig. 2.

The results of the discussion in this chapter that the AHP method has produced a sequence of factors affecting the production of crude palm oil at sindora palm oil mill. The main priority factor comes from the internal factor of the company. And globally result calculation using expert choice 11, i.e., a sequence of 1-3 are the most influential in the production at sindora palm oil mill and need to take precedence in advance. The first factor is the goods production time 23.3 %, the second factor is the delivery time factor 10.9% and the third factor is the quality of labour factor 10.3%.

RESULTS AND DISCUSSION

The results of the discussion in this chapter that the AHP method has produced a sequence of factors affecting the production of crude palm oil at sindora palm oil mill. The main priority factor comes from the internal factor of the company. And globally result calculation using expert choice 11, i.e., a sequence of 1-3 are the most influential in the production at sindora palm oil mill and need to take precedence in advance. The first factor is the goods production time 23.3%, the second factor is the delivery time factor 10.9% and the third factor is the quality of labour factor 10.3%. In the decision-making process of the production company Sindora palm oil mill

involves a lot of things to consider to avoid missteps. A decision maker must cleverly and carefully and have a good technique to help quickly and easily in taking decisions. In this study, there are three objectives as in the sub-chapter 1.5. Research objective is to determine the priority order of production factors which affects the production planning in the company using Analytical Hierarchy Process (AHP). After doing an interview and a questionnaire to 5 of the respondents, who are expert in production. Then, obtained the test results of AHP, i.e., the order of factor of production from existing levels in the hierarchical structure. At level II, the internal factor to be the top priority. And then, At level III, the capital factor is a top priority, the next factor is the labour factor, raw material factor and the latter is the technology and machine factor. Then from level IV obtained the order of 1-26 factor. Which the main priority is goods production time factor and the second priority is the delivery time factor and the third factor is the quality of labour. For the next factor as shown in Fig. 2. The order of these factors is the order of the factors that often cause a decrease in the amount of CPO production in sindora palm oil mill and became special factors that need to be given more attention in terms of handling. So, the first objective has been fulfilled and can be used as an overview to the decision makers in the companies.

CONCLUSION

Meanwhile, analytical hierarchy process has produced the order of factors that affect the amount of production. Those factors have rank from major until the

last one. Which means that most contributed to the problem that less influence. The sequence as an overview for decision makers in the company to determine the factors of production which should be prioritized to be resolved. The sequences to help facilitate decision makers (production manager) in resolving the problems that arise. Thus both of these methods can be applied with properly in the company. And can help a lot the company production planning. Then, providing new knowledge on researchers about a decision-making method that efficiently and effectively.

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