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RELATIVE EFFICIENCY OF PLANTATION COMPANIES IN MALAYSIA: A FINANCIAL RATIO-BASED DATA ENVELOPMENT ANALYSIS APPROACH

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ABSTRACT

This study examines the relative efficiency of 31 plantation companies in Malaysia based on data for the first three cumulated quarters of 2012 (January - September). The study applies an adopted version of Data Envelopment Analysis (DEA). DEA is a tool used to weigh the inputs/outputs and measure the relative efficiency of decision-making units. This research adopts an output-oriented form of DEA based on financial ratios without the utilization of inputs. The innovative adopted DEA model provides a comprehensive decision on a company's efficiency by taking into account various financial ratios all together and combining them into a single measure of efficiency. The results show that out of the 31 plantation companies in Malaysia, only five (16.13%) proved to be efficient. Also, it is found that the higher a company's financial ratio in relation to the equivalent ratios of other companies, the higher the efficiency score of that company.

Keywords: Efficiency, Data Envelopment Analysis, Malaysia, Plantation Companies

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INTRODUCTION

The importance of studying about the efficiency on plantation industry in Malaysia is centered on the fact that, one of the key products of the plantation industry (palm oil) has now become known as the fastest growing large-scale agricultural product in the world. This is due to the fact that the demand for biofuels in the EU is rising and 50 percent of all products in European supermarkets contain palm oil. Despite the increase in consumption all over the globe, the production of palm oil is mainly in Malaysia and Indonesia. These two countries make up over 80 percent of the global production of palm oil (Pichler, 2012).

The Malaysian government started the promotion of palm oil in the early 1960s and Malaysia was among the countries that made early commercial efforts in the patronage of palm oil cultivation and diversification successful. When the Industrial Master Plan (IMP) was launched in 1986, palm oil became Malaysia's leading agricultural commodity and third largest export earner. Malaysia now accounts for a good percentage of the world's production of palm oil. The plantations, processors, and manufacturers in Malaysia are generally considered to be among those operating at the industry's technological frontier (Rasiah & Shahrin, 2006). Currently, in Malaysia the palm oil plantation sector is the second largest export revenue earner following the electrical and electronics (E&E) sector. Also, Malaysia is one of the world's top exporters of palm oil, contributing about 47% of global exports. Similarly, it is the second in the world in terms of palm oil production accounting for about 41% of global production (MARC, 2012). Accordingly, analyzing and evaluating the efficiency of Malaysian plantation companies is a very important issue for the Malaysian government and plantation industry in general.

The companies operating in the industry in general can be classified in terms of three different categories which include upstream, downstream and integrated players which may include exporters and importers, customers, government agencies as well as other players like NGOs. Those directly involved in the cultivation, production and processing of palm oil into crude palm oil (CPO) and palm kernel oil refers to the upstream companies. The palm oil refiners, palm kernel crushers, manufacturers of palm-based edible products and specialty oils and fats are downstream companies. The sizes of the plantation companies differ considerably ranging from a little hundred hectares to over 100,000 hectares. Some of the largest plantation companies in terms of commercial activities include, Sime Darby Berhad, Kuala Lumpur Kepong Berhad and IOI Corporation Berhad. Moreover, in terms of planted area, Kumpulan Guthrie Berhad, Golden Hope Plantations Berhad, IOI Corporation Berhad and Sime Darby Berhad are among the five largest plantation companies in Malaysia (Hai, 2002 and MARC, 2012).

Based on historical statistics, Malaysian palm oil yields have typically appreciated over time reaching its high level in the period of 1998-2008, with yields increasing by about 4% annually. Incremental improvements in plantation productivity are created due to the highly organized nature of the industry backed by world-class public and private sector crop research as well as plenty financial resources. Nevertheless in 2009, an unanticipated ruin in the long-standing national growth pattern took place and has continued to the present day. This indicates that a potentially complicated pattern has come and therefore something needs to be done about the situation (USDA, 2012). This decrease in the national growth pattern starting 2009 triggers an important question. That is, are the companies in the plantation industry in general performing below efficiency or there are some companies that are efficient despite the overall decline in the performance of the palm oil sector? This paper is an attempt to answer this question by studying the relative efficiency of plantation companies in Malaysia based on financial ratio Data Envelopment Analysis (DEA) approach.

This study has been organized as follows: Chapter 1 presents the background to the study; while a summary of related research findings are given in chapter 2 which covers the literature review part. Chapter 3 discusses the data and methodology used for the research. The findings and outcome of the study are given in chapter 4 while chapter 5 concludes the study with some policy recommendations.

LITERATURE REVIEW

PLANTATION INDUSTRY

In Malaysia, plantation industry is an integral part of the country's Economic Transformation Program. This is demonstrated by the fact that, rubber and oil palm are included in the twelve key economic areas that the Malaysian government is promoting. The palm oil industry for instance supported the country during the financial instability in 1998 by helping to curb several negative effects of the crisis. The country's export earnings recorded about 20%

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contribution from palm oil industry representing a growth of above 20% as compared to year 2011. Nevertheless, in 2011, the contribution of plantation industry to the GDP or GNI of Malaysia has been very remarkable. In terms of percentage, the industry contributed about 7% to GDP of the country. And in terms of dollar value, about RM114bn ($36.4bn) was contributed and it is hoped that by 2020 it will reach about RM240bn ($76.6bn) (The Prospect Group, 2012).

With the aim of understanding the dynamics and determinants of performance within the Malaysian palm oil sector, Ramasamy *et al.* (2005) analyzed the effects of firm size and firm ownership on the level of profitability in this sector. Their findings showed that, size has an inverse relationship with performance. However, plantation companies that are privately owned are managed in a more profitable manner. Larger firm size may lead to higher performance in some industries but this is not the case in plantation industry. In an attempt to classify companies into performing and non-performing ones, Ridzwan Shah *et al.* (2008) used multiple discriminant analysis (MDA) and multiple regression as well as ratios to identify the performing and non-performing Shariah compliant companies in plantation industry in Malaysia. They found that turnover ratio is the only ratio that could differentiate between the performing and non-performing companies in the plantation industry. According to MARC (2012) despite the instability in the CPO prices, integrated companies which are involved in both upstream and downstream activities have been argued to have the highest performance in terms of credit profiles. This is shown by their larger earnings strength.

Matahir & Tuyon (2012) employed Johansen-Juselius (1990) cointegration test along with vector error-correction model (VECM) to investigate the dynamic synergies between agricultural sector and economic growth in Malaysia for the duration of historical economic policy adjustment from 1970 to 2010. Their study found that agriculture and economic growth are moving together in the long run but the contribution of agriculture sector output to the Malaysian economy was falling notwithstanding the several policies that have been implemented such as the New Economic Model *(NEM).* Kumar and Basu (2008) measured the Malmquist Productivity Index and its different components under the assumption of variable returns to scale in the Indian food industry from 1988-1989 to 2004-2005. They also examined the variation in productivity and the components productivity with respect to internal factors of firms. It is found that the increase in the growth rate of output in Indian food industry does not essentially lead to increase in growth rate of productivity and efficiency.

DATA ENVELOPMENT ANALYSIS (DEA)

Data Envelopment Analysis (DEA) has become a great quantitative as well as analytical tool for measuring and evaluating the performance of companies in almost every industry since 1978. According to Cooper *et al.* (2011) DEA *is a "data-oriented" approach for evaluating the performance of a set of peer entities called Decision-Making Units (DMUs), which convert multiple inputs into multiple outputs.* DEA has been successfully applied to a wide range of diverse forms of companies engaged in a variety of activities in many circumstances globally. It has been used to measure the performance of entities, such as hospitals, US Air Force wings, universities, cities, courts, business firms as well as the performance of countries, regions, and the like (Cooper *et al.*, 2011).

Talib and Wee (2009) used Data Envelopment Analysis (DEA) approach to evaluate the efficiency and productivity of 40 plantation companies listed in Kuala Lumpur Stock Exchange (KLSE) in 2007. They applied the DEA index and Malmquist Total Factor Productivity Changes (TFPC) in terms of technology changes, technical efficiency changes, and productivity growth. Their study results showed that only 21 plantation companies achieve the Total Factor Productivity Changes (TFPC) and 19 companies have no changes in the TFPC. The companies' performance was more reliant on changes of technical efficiency as compared to technological changes. In addition, the value of equity, assets and cost of labor are significant in influencing the companies' earnings.

With the aim of measuring and assessing the performance of 100 largest listed companies in Malaysia, Mohamad and Said (2010) used a customized strictly output-oriented DEA model to measure the relative performance of each company based on multidimensional performance indicators under the assumptions of CRS and VRS. The results indicate that out of the 100 companies, only 6% are fairly efficient under CRS and 19% are fairly efficient under VRS. In addition, only 6% of the top-ranked companies based on revenue are 100% scale efficient. The rest of the companies showed severe scale inefficiencies. Thus, companies that are ranked high in terms of revenue are not necessarily ranked high in terms of performance.

Abdullah *et al.* (2012) used input oriented DEA approach to study about the operational performance of 189 top performing companies from seven industries listed on the Kuala Lumpur Composite Index. They found that the companies achieved three quarter efficiency level approximately. And that over half of the companies were operating below average efficiency level while the rest will face challenges in making themselves efficient in short

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term. However, about half of all the companies are seen to be operating without wastage as they are able to achieve maximum output with minimum cost.

With data from 1989-1990 to 2006-2007, Mandal and Madheswaran (2009) used DEA and Directional Distance Function (DDF), based on the structure of production theory, to measure energy use efficiency in Indian cement industry as well as estimate the factors that explain inter-firm variations in energy use efficiency. The outcome of the study signify that, despite the potential for energy saving varies across firms, there is enough scope for the Indian cement firms to reduce energy usage. They also found that higher energy efficiency scores are attributed to firms with larger production volume. However, a firm's length of stay in the industry (age) does not have any significant influence on energy use efficiency.

Financial ratios can be used in DEA to give a better picture of a firm's performance unlike measuring performance based on only financial ratios. Worthington (1998) used 30 listed Australian gold producers as a sample to compare the financial performance measures provided by accounting-based financial ratios and production performance as measured by efficiency indicators. The author found that simple ratios may not be able to offer efficiency rankings like those found in multiple input and output methodologies. However, when the two techniques are used jointly, they can give results that offer valuable insights into the concept of firm performance despite the fact that the two differ significantly on the relative performance of individual decision-making units. Using an output-oriented version of Data Envelopment Analysis (DEA) based on financial ratios in which inputs were not used, Ablanedo-Rosas *et al.* (2010) examined the relative efficiency of 11 major Chinese ports covering a period of January to September 2007. The study revealed that the higher a port's efficiency ratio with respect to the related ratio of another port, the higher the efficiency of that port. Meaning that, a port is said to have higher efficiency if it has a higher efficiency ratio as compared to another port.

Farsi and Filippini (2006) examined the productive efficiency of Swiss hospitals sector using a panel data of 214 general hospitals over a period of four years from 1998 and 2001. 459 observations from 156 hospitals have been used as the final sample for cost frontier analysis with an average span of three years. Adopting a stochastic total cost frontier with a Cobb-Douglas functional form as the methodology, their study found that cost frontier analysis advocates a significant potential for improving efficiency. Similarly, Hollingsworth *et al.* (1999) reviewed several literatures on the application of DEA to measuring the productive performance of health care services in the USA and Europe (EU).

DEA has also been widely used to measure efficiency and performance in education sector. Some studies about efficiency and performance in education sector using DEA include Johnes and Johnes (1993), Breu and Raab (1994), Athanassopoulos and Shale (1997), Chu Ng and Li (2000), Abbott and Doucouliagos (2003) and Johnes (2006). Johnes and Johnes (1993) examined the research performance of UK economics departments while Athanassopoulos and Shale (1997) assessed the comparative efficiency of higher education institutions in the UK. Chu Ng and Li (2000) examined the effectiveness of the education reform implemented in the mid-1980s in China using data from 84 key Chinese higher education institutions. Johnes (2006) explored the advantages and disadvantages of various techniques for measuring efficiency in the framework of higher education. The author found that, due to the fact that DEA can be applied in a multiple input and output production circumstances, it is an attractive technique for measuring the efficiency of higher education institutions.

Based on all the above studies, it can be found that only Talib and Wee (2009) applied DEA to study about the plantation industry in Malaysia. They used the DEA index and Malmquist Total Factor Productivity Change (TFPC). Therefore, there is still no study about the plantation industry in Malaysia using the financial ratio-based DEA approach. This has therefore necessitates this study.

DATA AND METHODOLOGY

This study makes use of 2012 Q3 financial reports of 31 companies in the plantation industry in Malaysia. Data is collected from Emerging Markets Information Services (EMIS) database. The paper implements a financial ratio-based DEA model to assess the efficiency of the plantation companies in Malaysia. Based on previous literature, this study considers six financial ratios as output variables which include Return on equity, Total asset turnover, Accounts receivable turnover, Inventory turnover, Current ratio and Quick ratio. The fundamental idea of DEA is to change inputs into outputs in order that the efficiency of DMUs could be determined. This is done by taking into consideration an assumption that, during the changing process of inputs into outputs, a number of resources for instance labor, land, and capital should be consumed. Consequently, efficiency scores of output/input ought to always be less than or equal to 1. Efficient DMUs have an efficiency score equal to 1 while inefficient DMUs are relatively determined by comparing them with the efficient DMUs. This DEA model presents a comprehensive

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result on a company's efficiency by taking into consideration various financial ratios at the same time and combining those ratios into a single measure of efficiency. Mathematical model is solved for every company and the relative efficiency of each company is ascertained. In the DEA results, the higher a company's efficiency ratio in relation to the corresponding ratio of another company, the higher the efficiency of that company (Ablanedo-Rosas *et al.*, 2010). When using variable returns to scale, the model can be defined as follows:

Assume there are n DMUs, where each DMU_i (i = 1, . . ., n) produces q outputs y_{ij} (j = 1, . . ., q). Let α_i be the decision variable or the DEA coefficient associated with DMU*i*. The DEA model is the following linear programming problem:

$$\text{Max } \lambda_0$$

$$\text{subject to}$$

$$\sum_{i=1}^{n} \alpha_i = 1$$

$$\sum_{i=1}^{n} y_{ij}\alpha_i \geq y_{i0}\lambda_0 \qquad j = 1, \ldots, q$$

$$\lambda_0 \geq 0,\ \alpha_i \geq 0,\ \forall I$$

In the case of VRS model, a convexity constraint (N1 λ = 1) is added to the Constant Returns to Scale (CRS) linear programming problem which gives the following:

$$\begin{aligned} &\text{Min}_{\Theta,\lambda} && \Theta, \\ &\text{Subject to} && -y_i + Y\lambda \geq 0, \\ &&& \Theta x_i - X\lambda \geq 0, \\ &&& N1'\lambda = 1, \\ &&& \lambda \geq 0, \end{aligned}$$

where the estimated value of Θ is the efficiency score for each *N* DMU which in the vector Θ must be less than or equal to 1. *N1* is an N x 1 vector of ones. The problem has to be solved N times, once for each DMU in order to obtain a set of N technical efficiency scores.

EMPIRICAL RESULTS

Table 1: Malaysian plantation companies and their selected financial ratios

No.	*DMU*	*Return on Equity (%)*	*Total Assets Turnover (no.)*	*Accounts Receivable Turnover (no.)*	*Inventory Turnover (no.)*	*Current Ratio (times)*	*Quick Ratio (times)*
1	Astral Asia Bhd	3.4	0.10	5.21	34.91	0.98	0.96
2	Batu Kawan Bhd	11.17	0.07	1.46	0.00	3.51	3.07
3	BLD Plantation Bhd	8.05	1.04	21.24	8.28	1.22	0.84
4	Boustead Holdings Bhd	5.77	0.56	3.99	0.00	0.89	0.73
5	Cepatwawasan Group Bhd	4.37	0.30	10.63	8.97	2.56	2.03
6	Chin Teck Plantations Bhd	6.15	0.14	11.97	12.19	44.52	44.05

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7	Far East Holdings Bhd	7.86	0.27	4.88	0.00	7.31	6.75
8	Genting Plantations Bhd	7.18	0.20	4.31	2.94	5.57	5.03
9	Glenealy Plantations (M) Bhd	7.64	0.25	4.85	0.00	7.03	6.49
10	Hap Seng Plantations Holdings Bhd	5.94	0.19	9.16	0.00	4.53	3.49
11	Harn Len Corporation Bhd	0.18	0.34	8.15	14.78	0.34	0.27
12	IOI Corporation Berhad	91.9	0.60	6.89	0.00	4.49	2.60
13	Kim Loong Resources Bhd	15.76	0.82	30.85	10.34	2.92	2.47
14	Kluang Rubber Co (M) Bhd	1.13	0.01	14.36	129.00	26.64	26.64
15	Kretam Holdings Bhd	5.29	0.21	4.70	2.61	2.87	1.98
16	Kuala Lumpur Kepong Bhd	1.24	0.79	6.46	0.00	2.20	1.54
17	Kulim (M) Bhd	17.46	0.32	7.38	0.00	1.31	1.02
18	Kwantas Corporation Bhd	2.91	0.44	9.80	4.81	0.64	0.38
19	MHC Plantations Bhd	5.4	0.07	7.43	6.90	0.76	0.66
20	Negri Sembilan Oil Palms Bhd	4.26	0.13	12.17	9.45	26.25	25.72
21	NPC Resources Bhd	3.97	0.60	17.15	3.84	0.78	0.49
22	Rimbunan Sawit Bhd	2.49	0.16	10.97	5.07	0.71	0.55
23	Riverview Rubber Estates Bhd	6.65	0.11	4.31	13.23	30.31	30.07
24	Sarawak Oil Palms Bhd	10.03	0.39	17.89	3.21	2.41	1.80
25	Sarawak Plantation Bhd	9.23	0.45	6.85	9.28	2.13	1.89
26	Sungei Bagan Rub. Co (M) Bhd	1.48	0.02	25.35	3.78	67.44	67.22
27	TH Plantations Bhd	8.5	0.21	3.57	4.71	1.24	1.01
28	Tradewinds Plantation Bhd	6.96	0.51	6.39	0.00	0.88	0.52
29	Unico-Desa Plantations Bhd	7.17	0.22	19.59	13.31	1.45	1.36
30	United Malacca Bhd	7.05	0.16	13.40	5.49	6.92	6.40
31	United Plantations Bhd	11.79	0.38	11.99	0.00	9.08	7.29
	Max	91.9	1.04	30.85	129	67.44	67.22
	Mean	9.30	0.32	10.43	9.91	8.71	8.24
	Min	0.18	0.01	1.46	0.00	0.34	0.27
	Variance	250.54	0.06	47.41	539.05	228.87	229.94
	STD	15.83	0.25	6.89	23.22	15.13	15.16

DMU, decision making unit

Table 1 above describes the financial ratios for 31 plantation companies in Malaysia for the first three cumulated quarters of 2012 (2012 Q3C). In Table 1, the 'Return on equity' column shows that IOI Corporation Berhad, Kulim (M) Bhd, Kim Loong Resources Bhd, United Plantations Bhd, Batu Kawan Bhd and Sarawak Oil Palms Bhd have higher return on equity ratios (>10%), which indicates that these six companies were very profitable, and on the whole, they have managed their companies efficiently. In the 'Total asset turnover' column, it shows that BLD Plantation Bhd, IOI Corporation Berhad, Kim Loong Resources Bhd, Boustead Holdings Bhd, Kuala Lumpur Kepong Bhd, NPC Resources Bhd and Tradewinds Plantation Bhd have higher total asset turnover ratios (>50%), which suggests that these seven companies were more efficient in using their assets to generate revenues. From the 'Accounts receivable turnover' column, it is clear that Kim Loong Resources Bhd, BLD Plantation Bhd and Sungei Bagan Rubber Co (M) Bhd were the most efficient in terms of collecting accounts receivable (>20). The 'Inventory turnover' column shows that Kluang Rubber Co (M) Bhd was the single most efficient company in managing its inventory, and the last two columns show the liquidity and solvency status of a company. According to these columns, Sungei Bagan Rubber Co (M) Bhd had the higher current and quick ratios.

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This indicates that it is in a good liquidity position and it has the ability in paying its liabilities quickly without relying on inventory.

Table 2 shows the efficiency score for each plantation company. The first column represents the number, the second column is the DMU representing the company name, the third column is the efficiency score for each DMU, and the remaining columns correspond to the associated optimal coefficients (α_i) for each company. The results show that only five (16.13%) out of the 31 plantation companies proved to be efficient. These five efficient companies include IOI Corporation Berhad, BLD Plantation Bhd, Kim Loong Resources Bhd, Kluang Rubber Co (M) Bhd, and Sungei Bagan Rubber Co (M) Bhd. The company with the lowest efficiency score is Batu Kawan Bhd with an efficiency score of 0.164765. The rest of the inefficient companies have efficiency scores ranging from 0.164765 to 0.839699. The optimal coefficient values (α_i) for each company is defined by the reference set. For example, Astral Asia Bhd has a score of 0.370585, and it is considered as inefficient when compared with company number 3, 12 and 14 as defined by its coefficients 0.211, 0.073 and 0.717 respectively.

Table 2: Efficiency score for decision-making units (DMU)

No	*DMU (Company Name)*	*Efficiency Score*	*Optimal coefficients (α_i)*				
			3	12	13	14	26
1	Astral Asia Bhd	0.370585	0.211	0.073		0.717	
2	Batu Kawan Bhd	0.164765		0.733			0.267
3	BLD Plantation Bhd	1	1.000				
4	Boustead Holdings Bhd	0.548907	0.964	0.030			0.007
5	Cepatwawasan Group Bhd	0.394466	0.207		0.663	0.109	0.021
6	Chin Teck Plantations Bhd	0.839699	0.112	0.057		0.083	0.747
7	Far East Holdings Bhd	0.385118	0.572	0.168			0.260
8	Genting Plantations Bhd	0.299786	0.515	0.211		0.036	0.238
9	Glenealy Plantations (M) Bhd	0.361866	0.557	0.177			0.266
10	Hap Seng Plantations Holdings Bhd	0.323364		0.066	0.764		0.170
11	Harn Len Corporation Bhd	0.41967	0.777			0.223	
12	IOI Corporation Berhad	1		1.000			
13	Kim Loong Resources Bhd	1			1.000		
14	Kluang Rubber Co (M) Bhd	1				1.000	
15	Kretam Holdings Bhd	0.260019	0.682	0.159		0.030	0.129
16	Kuala Lumpur Kepong Bhd	0.778226	0.976				0.024
17	Kulim (M) Bhd	0.402486	0.311	0.396	0.285		0.008
18	Kwantas Corporation Bhd	0.442045	0.87		0.111	0.020	
19	MHC Plantations Bhd	0.276084		0.075	0.795	0.130	
20	Negri Sembilan Oil Palms Bhd	0.550034	0.181	0.057		0.102	0.660
21	NPC Resources Bhd	0.650363	0.466		0.534		
22	Rimbunan Sawit Bhd	0.361588			0.969	0.031	
23	Riverview Rubber Estates Bhd	0.618769	0.102	0.096		0.140	0.663
24	Sarawak Oil Palms Bhd	0.590596		0.019	0.963		0.017
25	Sarawak Plantation Bhd	0.508551	0.776	0.128		0.092	0.004
26	Sungei Bagan Rubber Co (M) Bhd	1					1.000
27	TH Plantations Bhd	0.261339	0.598	0.300		0.101	
28	Tradewinds Plantation Bhd	0.507152	0.928	0.068			0.004

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29	Unico-Desa Plantations Bhd	0.664036			0.918	0.082	
30	United Malacca Bhd	0.46563		0.029	0.771	0.024	0.175
31	United Plantations Bhd	0.544944	0.399	0.159	0.223		0.219

Table 3: Ranks for Decision-making units (DMUs)

No	*DMU*	*Efficiency Score*	*Times as a benchmark for another DMU*	*Reference Set*	Rank
12	IOI Corporation Berhad	1.000	19	12 (19)	1
3	BLD Plantation Bhd	1.000	19	3 (19)	1
26	Sungei Bagan Rubber Co (M) Bhd	1.000	18	26 (18)	2
14	Kluang Rubber Co (M) Bhd	1.000	15	14 (15)	3
13	Kim Loong Resources Bhd	1.000	11	13 (11)	4
6	Chin Teck Plantations Bhd	0.8397	0	3, 12, 14, 26	5
16	Kuala Lumpur Kepong Bhd	0.77823	0	3, 26	6
29	Unico-Desa Plantations Bhd	0.66404	0	13, 14	7
21	NPC Resources Bhd	0.65036	0	3, 13	8
23	Riverview Rubber Estates Bhd	0.61877	0	3, 12, 14, 26	9
24	Sarawak Oil Palms Bhd	0.5906	0	12, 13, 26	10
20	Negri Sembilan Oil Palms Bhd	0.55003	0	3, 12, 14, 26	11
4	Boustead Holdings Bhd	0.54891	0	3, 12, 26	12
31	United Plantations Bhd	0.54494	0	3, 12, 13, 26	13
25	Sarawak Plantation Bhd	0.50855	0	3, 12, 14, 26	14
28	Tradewinds Plantation Bhd	0.50715	0	3, 12, 26	15
30	United Malacca Bhd	0.46563	0	12, 13, 14, 26	16
18	Kwantas Corporation Bhd	0.44205	0	3, 13, 14	17
11	Harn Len Corporation Bhd	0.41967	0	3, 14	18
17	Kulim (M) Bhd	0.40249	0	3, 12, 13, 26	19
5	Cepatwawasan Group Bhd	0.39447	0	3, 13, 14, 26	20
7	Far East Holdings Bhd	0.38512	0	3, 12, 26	21
1	Astral Asia Bhd	0.37059	0	3, 12, 14	22
9	Glenealy Plantations (M) Bhd	0.36187	0	3, 12, 26	23
22	Rimbunan Sawit Bhd	0.36159	0	13, 14	24
10	Hap Seng Plantations Holdings Bhd	0.32336	0	12, 13, 26	25
8	Genting Plantations Bhd	0.29979	0	3, 12, 14, 26	26
19	MHC Plantations Bhd	0.27608	0	12, 13, 14	27
27	TH Plantations Bhd	0.26134	0	3, 12, 14	28
15	Kretam Holdings Bhd	0.26002	0	3, 12, 14, 26	29
2	Batu Kawan Bhd	0.16477	0	12, 26	30

Table 3 reports the rank for each DMU, with the first column representing the number, the second column is the DMU (company name), the third column showing the efficiency score, the fourth column indicating the number of times an efficient company serves as a benchmark for inefficient company, the fifth column is the

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reference set, and the last column is the assigned rank. The number in parentheses in the fifth column of the efficient companies is the number of times the company appeared as reference or benchmark for inefficient companies. The values of inefficient companies in this column are thus zero. The five efficient companies have therefore been ranked based on the number of times each of them appears as a benchmark for inefficient companies. Based on the overall results in Table 3, the most efficient companies were IOI Corporation Berhad and BLD Plantation Bhd. The result was not surprising because according to Hai (2002) and a report by the Malaysian Rating Corporation Berhad, published in 2012, IOI Corporation Berhad is one of the largest plantation companies in Malaysia in terms of commercial activities. And in terms of planted area, it is also among the top five largest in Malaysia. No wonder it appeared as reference for 19 companies out of the 26 inefficient companies just as BLD Plantation Bhd. Similarly, IOI Corporation Berhad had the highest return on equity ratio (91.9%) indicating that it was very profitable, and in general, managed its resources efficiently. Also, BLD Plantation Bhd on the other hand had the highest total asset turnover (1.04) which suggests that it was the most efficient in using its assets to generate revenues. Sungei Bagan Rubber Co (M) Bhd was ranked second after IOI Corporation Berhad and BLD Plantation Bhd, mainly due to its highest current ratio (67.44) and quick ratio (67.22), which measures the efficiency of a company by indicating how quickly it could pay current liabilities using current assets only. It also appeared as benchmark for 18 inefficient companies. Kluang Rubber Co (M) Bhd was ranked third and it has been a benchmark for 15 inefficient companies. In addition, Kluang Rubber Co (M) Bhd had the highest inventory turnover ratio (129.00). The fourth one was Kim Loong Resources Bhd which had the highest accounts receivable turnover ratio (30.85) and also a benchmark for 11 inefficient companies.

The rest of the 26 companies were considered as inefficient with the lowest one being Batu Kawan Bhd. Taking the case of Batu Kawan Bhd as an illustration, the accounts receivable turnover ratio (1.46) and inventory turnover ratio (0.00) for Batu Kawan Bhd are far below the average of 10.43 and 9.91 respectively as shown in Table 1. Accordingly, Batu Kawan Bhd needs to improve its efficiency from multiple dimensions including accelerating accounts receivable collection and optimizing inventory level.

CONCLUSION

This paper looks at the efficiency of 31 plantation companies in Malaysia by utilizing a financial ratio-based DEA approach in which no inputs were used. With the intent of attaining important information that might be useful for decision-making processes, the efficiency changes of the 31 Malaysian plantation companies for the first three cumulated quarters of 2012 were analyzed. The output variables for this study were return on equity, inventory turnover, total asset turnover, accounts receivable turnover, current ratio, and quick ratio.

The results show a total of only five (16.13%) efficient plantation companies out of 31 companies. IOI Corporation Berhad and BLD Plantation Bhd were ranked number one, which was not surprising because IOI Corporation Berhad had the highest return on equity ratio (91.9%) indicating that it was very profitable, and in general, managed its resources efficiently. It also appeared as reference for 19 companies out of the 26 inefficient companies just as BLD Plantation Bhd. BLD Plantation Bhd too had the highest total asset turnover (1.04) which suggests that it was the most efficient in using its assets to generate revenues. Sungei Bagan Rubber Co (M) Bhd was ranked the second most efficient mainly due to its highest current ratio (67.44) and quick ratio (67.22) and it appeared as benchmark for 18 inefficient companies. Kluang Rubber Co (M) Bhd was ranked third and it had the highest inventory turnover ratio (129.00) and appeared as benchmark for 15 inefficient companies. Kim Loong Resources Bhd was ranked the fourth one which had the highest accounts receivable turnover ratio (30.85) and as benchmark for 11 inefficient companies. Batu Kawan Bhd was the worst because it had accounts receivable turnover ratio and inventory turnover ratio far below the average. Batu Kawan Bhd therefore needs to improve its efficiency from multiple dimensions including accelerating accounts receivable collection and optimizing inventory level.

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