

# Determination of Supply Chain Performance and Market Performance: Impact of Supply Chain Activities in Indonesian Crude Palm Oil Industry

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**Abstract-** Supply chain practices are crucial in determining the performance of firms. The current study investigates impact of supply chain practices for determining the market and supply chain performance in crude palm oil industry of Indonesia. The supply chain activities were taken from previous literature including supplier relationship, customer relationships and waste reduction. The objective of the study was to determine the impact of these crucial supply chain activities on market performance and supply chain performance in Indonesian crude palm oil producers. Data was collected from palm oil producers in Jakarta Indonesia, response rate was observed as 77%. The data was analyzed by using AMOS SEM technique. The relationship was examined between constructs and found mixed results, study revealed few practices has significantly associated with market performance and supply chain performance and did not find any significant influence between supplier relation and market performance; waste reduction and market performance was rejected statistically. The study contributes and suggests focusing on supply chain practices to gain benefits and competitive edge and explains the impact of supply chain practices on market performance and supply chain performance. The study conducted on crude palm oil industry of Indonesia for improvement in relationships and waste reduction to gain competitive edge and enhance performance. It explained relation between influential constructs to improve performance while considering supply chain effectiveness. Supply chain focus contributive for firms to optimal utilization of resources to reduce waste, efficient usage of resources and relationship with suppliers and customers.

**Keyword:** *Supply Chain, Market Performance, Crude Palm Oil*

## 1. Introduction

Indonesian palm oil industry is one of the important commodity to fulfill local demand and for international exports. The consumption of crude palm oil (CPO) at

domestic level reported as 25% of country's production [1]. The consumption of crude palm oil takes place in biodiesel production after food industry. Crude palm oil contributes 30% of government demand for biodiesel as key feedstock and targeted for 2025 [2]. Recently, researchers have found that Indonesian demand for crude palm oil for biodiesel has increased rapidly but the production of palm oil can meet the demands of both sectors including food and oil industry. The new plants can also be placed to meet the demand to increase the production for aligning the expanded usage of biofuel in country [3]. Important point of concern is to reduce costs for biodiesel and to improve supply chain of crude palm oil. Current paper researcher intendeds to determine the market performance and supply chain performance of crude palm oil producers and impact of customer relationship, supplier relationships and waste reduction. The current paper empirically examines the relationships of customer relation, supplier relation and waste reduction on supply chain performance and market performance. To examine the competitiveness of Indonesian palm oil industry exerts emphasis on improvement in supply chain to sustainable edge among competitors.

Considerable amount of biomass residue such as empty bunches of fruits, fiber, shell and palm oil mill seepage generated during the production of crude palm oil. The commodity is used for plantation of palm oil but still large portion remain unused and wasted in fields [4], [5]. The usage of palm oil biomass has increased rapidly as usage for bio-based products recently. Researchers have given and stated various examples of above stated scenario that palm oil bio resources includes branches of empty fruits, fibers, shell and milling effluents as feedstock for electricity production in heat and power plants. Bio fertilizers are also produced with empty fruit branches and waste can also be used alternatively. Recently, policies are devised for environment protection for improvement in performance of palm oil industry. The policies have been devised to reduce carbon emission in environment. But it has been reported

that these kinds of policies are ignored largely and slower for adoption that anticipation of authoritative bodies of government [6], [7], [8]. The profitability of bio fuel products reported as lower, economic values of palm oil biomass also remained unexplored; which insist to integrate value chain of crude palm oil and bio diesel production for improvement in economy and sustainability of industry [9].

There are various changes have been observed in market including increased competition, rapid technological advancements, innovations in services and manufacturing and information sharing with customers. Due to dramatic changes in market has increased uncertainty and market has become turbulent. The requirement of customers and turbulent environment of markets are instigated due to increased and changed demands of customers in adoption of newer technologies. The adoption of technology at industry level encourages companies to introduce innovative products at lower cost and higher quality with environmental friendly system and products. The capability of firms to adopt latest technologies and develop new innovative processes or products contributes in efficiency and efficient progress [9].

The realities of turbulent and competitive environment encourage firms to upgrade their supply chain which enable them timely transfer of raw material and required commodity at competitive price, acceptable quality and in minimum required time. Firms have faced challenges in improvements of their supply chain for increase in efficiency and effectiveness for sustainable competitive advantage. Effective management of supply chain can reduce cost, time for delivery and improvement in operational efficiency [10], [11]. Supply chain is managed with lean management to gain long term benefits and increase performance in highly turbulent environment [12], [13]. Currently, organizations have focused to improve their supply chain according to requirement of global market and competition; strategies have been developed overtime to address the dramatic changes of environment due to various factors [14].

Currently, trend has been noted that environmental awareness got attraction of researchers as it impacts on climate. Industry related issues and climate impact found to be very important and hot issues to consider as firms need to focus on their effectiveness of supply chain while considering environmental changes and damages [15]. Development in technology & industrial modernization instigated environmental issues. These issues show negative side of technology adoption such as gas emissions, pollutions, toxic gases and chemical reactions [16]. Asian

countries have attracted large number of manufacturers due to their policies and production facilities [17], [18].

Asian countries have huge labor which is available on competitive and lower price with low raw material cost. Major players of market also spread their business in Asia countries for contribution in economy, production and development of region. Emerging markets are 10% of world and consist on China, Taiwan, Malaysia, Indonesia, India, South Korea and Thailand. These emerging markets need to focus on their supply chains for improvement in their operational activities to gain competitive edge [16].

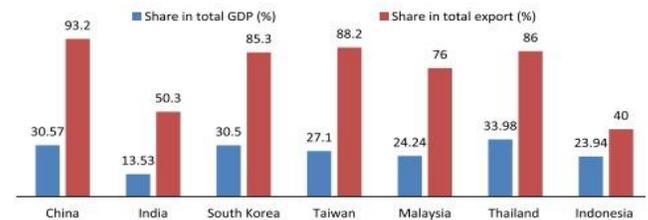


Fig: 1; contribution of manufacturing sector in GDP and exports; Source: Bloomberg (2014)

The statistics shows in fig 1 that contribution of manufacturing sector in GDP & Exports of Asian countries; the blue bar shows contribution in GDP and red bar shows contribution in exports. China at higher level of exports in Asian region and can be compare with other countries including Indonesia.

Previously, researchers have focused on role of supply chain management to sustain performance and competitive edge. There is scarcity of literature on management of supply chain in relation to practices for effective lean supply chain management. Previous literature still lack in explaining the relationship of supply chain management and supply chain performance and market performance in crude palm oil of Indonesian firms. There are rarely empirical studies found on the relationship of supply chain management, its performance and marker performance in Indonesian context.

Therefore, present study intends to explain relationship and impact of supply chain practices on supply chain performance and market performance of crude palm oil industry of Indonesia. The supply chain practices include customer relationship, supplier relationship and waste reduction to determine supply chain performance and market performance.

## 2. Literature review:

Recently, there is increased focus on effectiveness and sustainability of supply chain management to gain competitive edge and to enhance performance in various different sectors. Researchers have focused on supply chain management and integration issues for gaining competitive edge and sustainability. SCM is considered as an established field of research and practice which originate the ideas to reduce waste and to increase economic profitability [19],[89-91] [20]. The purpose of researchers on supply chain is to optimize performance economically at the targeted sector, at the same time focusing on environmental aspect.

Lean supply chain management defined as links of firms directly in upstream or downstream aspect for flow of raw material to finished goods, products or services. The required information flow and funds throughout organizational activities; for purpose to reduce cost and wastage and to fulfill customer's demand [21]. Researchers and practitioners focused on supply chain activities to reduce waste and cost for operational efficiency and ultimately achievement of goals [22], [23], [87-88]. Management system with lean aspect can also be applied throughout supply chain to improve performance; lean includes waste management and elimination of all steps in process which causes waste, which contribute for minimizing production cost and time. It also contributes in reduction of costs occurred on supply chain activities [24]. The lean management aspect is introduced in supply chain for improvement in performance of firms to meet customer demand and market performance. Lean supply chain management enable firms to harvest several benefits in terms of efficiency, reduction in cost, flexibility, reduce wastage material and increased competitive edge. This also contributes for smooth flow of production, information sharing and adoption of latest technology among supply chain nodes without wastage of material and time [25], [26].

Supply chain management helps to integrate into upstream and downstream activities which contributes in reduce waste by simplify process, optimize and streamline capabilities for achievement of goals [27]. It has been realized over time that supply chain management contribute in performance related outcomes [25].

### Supply chain performance:

Supply chain performance has been reported by various researchers in literature and various different perspectives have been investigated. Supply chain performance has been

investigated in product development and development of strategy focuses on efficiency [63]. Supply chain performance is measured in terms of cost, flexibility, responsiveness and relationship [64]. Flexibility and efficiency has considered by researchers to measure supply chain performance [65]. Various other researchers have considered efficiency and effectiveness to measure supply chain performance [66]. In similar line to research present study is formulated and intends to verify relation between customer relationship and supplier relationship to measure supply chain performance, waste reduction also considered in the present study to examine the supply chain performance. Efficient usage of resources encourages firms to develop technological advance operations to reduce waste management and to reduce inventory cost determines supply chain performance [45], [67].

Previous researchers have identified that flexibility found to be key measure for supply chain performance and also related to environmental uncertainty [68].

Present research paper considered to measure supply chain performance; the influential factors are considered as relationships with supplier, customers and waste management. the current study will enable researchers and practitioners to focus on highly influential factors including supplier and customers and one of most important factor waste management in crude palm oil industry of Indonesia.

### Market Performance:

Researchers have focused on performance in different aspects, market performance has attractive number of researchers as in present study it is considered as core construct. Market performance is often considered as market share and growth under market share category, sale indicators as volume and sales growth. For evaluation of market performance of any company or firm normally assessed by sales and growth rate [69], [70]. Researchers have pointed out various factors to be influential for market performance including comparative growth of sales, market growth and profitability as appropriate measure of market performance [71].

Customer satisfaction and delivery reliability to measure market performance [72], various researchers have considered responsiveness to customer needs and demands. Satisfaction of customers, profitability and market share and growth to measure market performance has been investigated [73]. In the present study, indicators of market performance supplier relationship, customer relationship and waste management at crude palm oil industry of Indonesia.

### **Supplier Relations and performance:**

Supplier of raw material considered as one of major entity in supply chain for any business. Relationship with supplier has crucial and significant importance in managing of supply chain. The ability of firm to establish strong, long-term and effective relationship with supplier described under the term supplier relationship. Firms' ability to establish long-term relationships with their key supplier enable them to manage their raw material supplies on time and in required quantity and quality to gain competitive advantage in highly turbulent environment [28], [29]. Supplier relationship is also defined as practice of organization to buy commodity for their production from supplier and applying knowledge and information for implementing operations and to generate common benefits and goals [30]. The relationship with supplier creates efficiency, certainty and contributes for reduction in cost and increase level of trust among participants [31]. The relationship with suppliers encourages participant entities to fulfill their responsibility and improve technological capabilities for supply chain. Effective relationship with supplier also enable organizations to align their capabilities and build learning opportunities; and contributive for reduction or elimination of wasted activities and time. It may entails long term contracts, integrated processes and mutual benefits along with risk and benefits sharing [14], [32].

Effective and close relationship with suppliers helps firms to reduce cost at inventory handling, mitigate risk, increases quality of product with quality raw material and stable supply with lower and competitive prices [33]. In nutshell, it has been observed over time that relationship with suppliers contributes significantly towards reduction of cost, improvement in quality, and innovative product design with flexibility, information sharing and improved delivery performance [34]. Strategic relationship with suppliers enables firms to establish close working relationship for effective supply chain and to gain mutual benefits [35], [36]. The studies have identified relationship between supply chain and performance and found influential phenomenon between integration with suppliers and supply chain performance [14]. Supplier integration found to be positively influential to performance of firms [37], [38]. Contrary, weak relationship has been depicted between supplier and performance [39].

On the base of above discussion the following hypothesis is formed:

**H1:** *Supplier relations positively influence market performance in crude palm oil industry of Indonesia*

**H2:** *Supplier relation positively influence supply chain performance of crude palm oil industry of Indonesia*

### **Customer relationship and performance:**

Relationship with customer remained major point of concern for researchers and firm owners as they target customers for their product to sale. Customers remain crucial factor in success for any firms. Customer relationship also defined as set of activities for developing long term relation with customers, management of their issues and complaints, most specifically increase customer satisfaction [40].

The mechanism of customer relationship management enable firms to gain information about products, market need; inventory needed and operational processes from major clients of organizations [41]. Further, researchers have defined customer relations in terms of satisfying their need, satisfy their relation on long term basis, improvement in satisfaction and effective complaint management system. Long term relation with customers can be achieved by implementation of above stated crucial activities and enable firms to gain competitive advantage [14], [42]. Customer relations focuses on solving various issues and problems faced by customers about the product usage, installation or after sale services, these activities enable firms to establish relations on long term basis, effective response from firms to customers for meeting their demands and increase satisfaction level of customers [43], [44].

Literature has depicted various benefits of customer relationship which includes loyalty as one of major long term benefit, efficiency of problem solving, developed latest knowledge and expertise sharing, improved understanding of needs of customers, responsiveness to customers, enhanced differentiation of products and market shares [14], [45]. Relationship between customers and manufacturer on long term basis resulted due to trust and ability to meet demand, cooperation among entities must be promoted, communication and coordination for problem solving which ultimately lead firms to improve their performance [46]. Customer loyalty can also be gained by implementing effective relationship, differentiation of products, value addition also play important role in establishing long term relationship [47]. Furthermore, effective communication for assess customers' need, feedback of customers and after sale services enable firms to recognize their needs and update their system. Two way relationship enable firms to initiate marketing efforts for customers and expected to enhance market performance and supply chain performance [48]-[50].

Researchers have found direct effect and relationship of customer relationship on market performance. Further, positive relationship has been empirically identified between customer integration and supply chain performance [45], [51]. Researchers have stated positive effect of customer relationship on various different performance aspects [52], [53].

On the basis of above discussion following hypothesis is formulated:

**H3:** *Customer relationship positively influence market performance in crude palm oil industry of Indonesia*

**H4:** *Customer relationship positively influence supply chain performance in crude palm oil industry of Indonesia*

#### **Waste reduction and performance:**

A human activity which produces non value creation outcome in reciprocity of resource consumption stated as waste [54]. Further, researchers have defined waste as “anything other than the absolute minimum resources of material, machines, and man power required to add value to the product” [55]. In simple words it is described as activity conducted by firms which consumes resources but the activity doesn’t add value for customers in end product [56]. Waste reduction is found to be a crucial and important in supply chain process which simplify and optimize the production process and proof of efficient supply chain [14]. The various types of waste included over production, wait time, inappropriate transportation, unnecessary movements, over processing, defective products, large quantity or excessive inventory and unused creativity of employees [57]. Researchers have identified four groups relates to wastage in offices. Which includes people waste, process related waste, informative waste and asset or physical resources waste. Reduction in waste found to be one of important and necessary objective to be achieved under lean management system which helps to eliminate non-value adding activities and other form of waste [57]-[59].

Lean principles found to be contributive in reduction of waste during processing or entire supply chain, it assess current situation and design of production system which helps to reduce waste. The techniques have been introduced for waste reduction during process [60]. Operational cost has been dropped dramatically due to the application of waste reduction strategies and firms have managed the cost, saved material, time and overall cost which is also helping in contributive in energy saving, waster and fuel; which is influential and positively related to supply chain performance and market performance [61]. Optimal

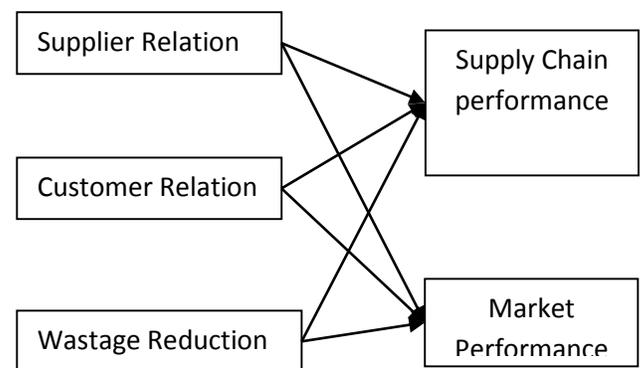
utilization of resources can be achieved by latest technology and waste reduction strategies; waste reduction helps to use maximum usage of resources with minimum waste which increase level of outcome. The improvement in supply chain performance have been observed and reported as influenced by effective performance and process consistency [62]. Positive relationship also has been reported in studies between elimination and maximization of production at manufacturing companies and firms.

On the basis of above discussion following hypothesis is formulated:

**H5:** *Waste reduction has relation with market performance at crude palm oil industry of Indonesia*

**H6:** *Waste reduction has relation with SC performance at crude palm oil industry of Indonesia*

#### **Research Framework:**



**Fig: 2: Research Frame work of study**

### **3. Research Methodology:**

Various methods have been used in previous studies to determine the relationships of constructs. Research design and methodology on crude palm oil industry of Indonesia, researcher has decided to use survey method to examine the empirically test the relationships [76]. Large number of sample for data collection can be easily managed via survey method and administer with moderate cost of data collection. Advantages of survey method, researcher intends to use survey for data collection from crude palm oil industry of Indonesia in Jakarta. The objective of the study is to examine the relationship of customer relations, supplier relations and waste management to determine the supply chain performance and market performance of crude palm oil producers in Indonesian market.

### Population and sample size:

Researchers have considered to empirically examine the relationships between customer, supplier relationship and waste management to determine market performance and supply chain performance at crude palm oil industry of Indonesia. Population of the study consists on all crude palm oil producers in capital city of Jakarta, Indonesia. The association of Indonesian palm oil producers stated that production of crude palm oil has reached 38.17 million tons in recent years. Further it is added that total palm oil production of Indonesia stands at 41.98 million tons in year of 2017-2018 [74]. This shows highest in region to produce crude palm oil and export it to various other countries. Indonesia is at top in region to produce palm oil and followed by Malaysia. The appropriate sample of population based on Karjcie and Morgan table. Sample size is selected based on Krejcie and Morgan (1970) table. According to Krejcie and Morgan (1970), if the total population is equal to or more than one hundred thousand then sample size should be 384. In the context of the current study, total population is larger than two hundred and fifty thousand. Therefore, the sample size is 384.

Questionnaire were distributors among all palm oil producers to determine the relevant constructs, respondents replied 321 questionnaire and 308 were usable as few were incomplete and others were not usable. The response rate was observed s 77% which is acceptable according to researchers [75].

### Instrument:

Questionnaire is developed of each construct on the base of previous literature. Questionnaire of each construct is adopted from various and relevant field of study. All items were measured on 5 point likert scale where 1 indicate strongly disagree and 5 indicate strongly agree.

### Supplier Relationship:

There are 07 items in construct to determine the level of supplier relationship. The scale is adopted from Seo, Y-J., Dinwoodie, J., and Kwak, DW., (2014) [77].

### Customer Relationship:

The construct of customer relationship consist on 07 items as well, and adopted from previous studies of relevant field. The scale is adopted from Kaliani Sundram, Veera Pandiyan, V. G. R. Chandran, and Muhammad Awais Bhatti (2016) [78].

### Waste Reduction:

To determine the waste reduction 07 items scale developed by Green Jr, Kenneth W., et al. (2014) [79]. The scale was adopted to determine waste reduction at palm oil industry of Indonesia.

### Supply chain Performance:

Supply chain measurement scale consists on 16 items which determine the supply chain performance. the scale was adopted from the study of Prajogo, D., Oke, A., and Olhager, J., (2016) [80].

### Market Performance:

The construct of market performance is measured by using scale of Flynn, Barbara B., Baofeng Huo, and Xiande Zhao (2010); and based on 05 items [81, 82, 83].

## 4. Results and discussion:

Relationships shown among constructs in research framework and hypotheses are examined by using AMOS 20 with SEM techniques. Cronbach alpha was examined of all constructs for examining the reliability of scale.

### Reliability and validity of the constructs:

The table 1 shows alpha values for each construct and therefore has strong reliability.

Table 1: Cronbach alpha ( $\alpha$ ) for constructs:

S#	Constructs	Mean	SD	Alpha ( $\alpha$ )
1	Market performance	3.99	0.961	0.935
2	SC performance	3.95	0.682	0.896
3	Customer relation	4.04	0.760	0.843
4	Supplier relation	3.84	0.795	0.847
5	Waste reduction	4.28	0.659	0.913

### Composite Reliability (CR):

Table 2: CR of constructs

S#	Constructs	CR	Remarks
1	Market performance	0.938	Good
2	SC performance	0.882	Good
3	Customer relation	0.845	Good
4	Supplier relation	0.858	Good
5	Waste reduction	0.912	Good

### Discriminate Validity:

Table 3: Discriminate validity

Constructs	MP	SCP	CR	SR	WR
MP	<b>0.890</b>				
SCP	0.819	<b>0.775</b>			
CR	0.791	0.711	<b>0.805</b>		
SR	0.678	0.691	0.765	<b>0.818</b>	
WR	0.662	0.672	0.761	0.684	<b>0.881</b>

### Description:

Measurement model considered and examined constructs to determine cronbach alpha, composite reliability and discriminate validity. In table 1 cronbach alpha is given of each construct. Mean and standard deviation is also depicted in the table. Market performance (MP) and supply chain performance (SCP) reported their alpha 0.935 and 0.896 respectively. Customer relation (CR) also presented in table with alpha value as 0.843; supplier relation (SR) was reported 0.847 as alpha value, waste reduction (WR) was examined for alpha value and reported as 0.913; the cutoff point for alpha value is considered as 0.6 as acceptable; table shows all values well higher than cutoff point and acceptable.

Table 2; shows composite reliability of constructs, market performance was examined for composite reliability and reported as 0.938; supply chain performance is depicted and shows CR value as 0.882; customer relationship was reported as 0.845 as CR; supplier relationship was examined for CR and value was reported as 0.858; waste reduction was examined and CR was reported as 0.912. This shows acceptable value and to be expected.

Discriminate validity of constructs are presented in table 3; diagonal values shows correlation values, and square roots value. Diagonal values shows for each construct and all values must be lower than the top diagonal bold value of column. The values shown in the table 3 are correlation and AVE values and acceptable.

### Structural model:

The current study used AMOS-SEM for establishment of structural model. Hypothesis testing is discussed in this phase of the study. Hypothesis Testing:

Hypothesis	Relationship	Regression	P-value	Result
H1	SR→MP	-0.104	0.030	NS
H2	SR→SCP	0.134	0.015	Accepted
H3	CR→MP	0.224	0.000	Accepted
H4	CR→SCP	0.349	0.000	Accepted
H5	WR→MP	-0.204	0.000	NS
H6	WR→SCP	0.207	0.000	Accepted

### Description:

Above table stated direct relationship among the constructs of the study. Hypothesis testing was examined by examining regression and p-value. The results show that hypothesis H2, H3, H4 and H6 are accepted and relationship found to be significant. This shows that supplier relation found to be helping to contribute for successful supply chain performance; the relationship shows regression value as 0.134 and sig value as 0.015; hence H2 is accepted. The relationship between customer relationship and market performance found to be acceptable as regression value is reported as 0.224 with sig value 0.000; hence H3 is acceptable [84]. The relationship between customer

relationship and supply chain performance found to be significant; whereas regression value between these two constructs reported as 0.349 and sig value 0.000; hence H4 is acceptable. The relationship between waste reduction and supply chain performance and regression is reported as 0.207 with sig value of 0.000; hence hypothesis H6 is acceptable statistically and found significant.

Contrary, hypothesis H1; H5 are rejected. Supplier relation and market performance found to be insignificant according to statistical results. Regression is reported as negative (-0.104) and p-value 0.03; hence H1 is statistically rejected. Hypothesis H5 is also rejected on statistical grounds. The regression in table is reported as (-0.204) and p value as 0.000; this shows that hypothesis is rejected.

## 5. Conclusion:

The study investigated the relationship between supplier relation, customer relation, waste reduction (IVs) and market performance and supply chain performance (DVs). Theoretical framework was developed in the study to determine the relationship among constructs. The effect independent variables are shown in crude palm oil industry of Indonesia. The effects of supplier relation, customer relation and waste reduction was investigated in the study. The result revealed interesting results that supply chain management practices including supplier relation, customer relations and waste reduction impact significantly on market performance and supply chain performance. Crude palm oil industry and producers of Indonesia must consider increase customer relations, supplier relations and waste reduction to gain more benefits and competitive advantage. Supplier relationship and waste reduction was not found to be significant related to market performance. Other relations such as supplier relations to supply chain performance, customer relations to market performance and supply chain performance found to be significant. Waste reduction to be positively significant related to supply chain performance.

Crude palm oil producers of Indonesian industry must consider customer relationship, supplier relationship to be effective in order to gain competitive edge, and latest technology must be adopted to control waste reduction for successful business processes, benefit gain and competitive edge. In nutshell, firms of palm oil producers must consider their supply chain activities to improve supply chain performance and market performance. In highly turbulent and competitive environment companies must increase their competitive advantage base for gaining benefits and improvement in supply chain [85, 86,92-95].

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