EFFICIENCY ANALYSIS OF PALM KERNEL OIL AS A RAW MATERIAL IN IMPROVING SUPPLY CHAIN PERFORMANCE: CASE STUDY AT PT XYZ

Analisis Efisiensi Sediaan Minyak Inti Sawit sebagai Bahan Baku dalam Mengingkatkam Kinerja Rantai Pasok: Studi Kasus pada PT XYZ

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ABSTRACT

This study aims to analyze the efficiency of raw materials supply and measure supply chain performance at PT XYZ. The method used to measure supply chain performance is SCOR. This research is limited to PKO raw material from suppliers and lauric acid products by PT XYZ. Results showed that the method of raw material procurement in PT XYZ was already efficient. The supply chain performance in PT XYZ was good yet only the POF matrix gives an unfavorable result compared to the brancmark from a similar company. Commonly in running operation of production, PT XYZ has several steps of supply chain that only involve suppliers, PT XYZ and direct to customer. The result showed from the measurement of matrix: level 1 is POF=88.36%, OFCT=44 days, and CTCCT=51 days. In level 2, PT XYZ conducted all activities in planning process (P1-P5), executing (S2, M1, M2, M3, D2, D3 and DR1) and enabling. On the mapping of level 2 obtained that the result of deliver process have the lowest performance and analysis in level 3 should be conducted to explain the deliver process in more detail.

Keywords: efficiency, palm kernel oil, performace, SCOR

ABSTRAK

Penelitian ini bertujuan untuk menganalisis efisiensi sediaan bahan baku dan mengukur kinerja rantai pasok di PT XYZ. Metode yang digunakan untuk mengukur kinerja rantai pasok adalah SCOR. Penelitian ini dibatasi pada bahan baku PKO dari pemasok dan produk lauric acid yang diproduksi oleh PT XYZ. Hasil penelitian menunjukkan bahwa metode sediaan bahan baku PT XYZ sudah efisien. Kinerja rantai pasok PT XYZ sudah baik hanya matrik POF yang memberikan hasil yang kurang baik dibandingkan dengan brancmark dari perusahaan sejenis. Secara umum dalam menjalankan operasi produksi, PT.XYZ memiliki tahapan rantai pasok yang hanya melibatkan pemasok, perusahaan (PT XYZ), dan langsung ke palanggan. Hasil yang diperoleh dari hasil pengukuran metrik: level 1 adalah POF = 88.36 persen, OFCT = 44 hari, dan CTCCT = 51 hari. Pada level 2, PT.XYZ melakukan seluruh kegiatan pada proses planning (P1-P5), executing (S2, M1, M2, M3, D2, D3, dan DR1) dan enabling. Pada pemetaan level 2 diperoleh hasil proses deliver memiliki kinerja paling rendah dan dilakukan analisis pada level 3 guna memaparkan lebih detil lagi proses deliver.

Kata kunci: efisiensi, minyak inti sawit, kinerja, SCOR

INTRODUCTION

The industrial sector plays a strategic role in driving national economic growth. One of the activities in the industrial sector is processing. With the processing of products into various derivative products, it will be able to provide added value. The greater added value of agricultural products can certainly play a role in increasing economic growth. In 2015, plantation crops contributed the most to GDP when compared to other business fields, amounting to 34.71 percent (BPS, 2016).

Palm oil is one of the plantation crops that has the highest export value for the type of industrial processing compared to other processing industries, namely 20,746.10 million USD or the equivalent of 19.45 percent of the total non-oil and gas exports of 93,750.30 million USD, but the basic chemical industry is only contributed 3.89 percent (Kementerian Perindustrian, 2016). The palm oil processing industry consists of upstream, intermediate and downstream industries. The basic chemical industry is included in the intermediate industry category, namely the utilization of products produced in the upstream industry to be used as raw materials. One of the basic chemical industries is the oleochemical industry, namely the use of Crude Palm Oil (CPO) and Palm Kernel Oil (PKO) for chemical products.

The low contribution of the basic chemical industry to export value is due to the low production capacity of the industry, even though the added value generated by these products is quite high. This phenomenon makes the government seek to strengthen the domestic industry through various policies. One of the policies implemented is the provision of fiscal incentives to

downstream industries in the domestic agro-industrial sector which took effect starting in 2010 (Media Industri, 2011).

Therefore, currently more and more companies are entering the oleochemical industry. Based on data from the Kementerian Perindustrian (2014) there are only nine oleochemical companies, but currently there are 12 companies starting to enter the industry. The increase in the number of companies is expected to increase production capacity. Another effort made by old companies is to increase production capacity. One of the oleochemical companies that is doing this is PT. XYZ. The company, which was founded in 1992, only had a production capacity of 88,000 tons per year, but since 2013 the production capacity has increased to 250,000 tons per year.

With the increasing number of companies entering the oleochemical industry, it can be said that there are more competitors in the business. Therefore PT. XYZ must be able to provide the best service to customers in order to retain customers, this will have an impact on the company's total sales by measuring supply chain performance at PT. XYZ.

The supply chain can be interpreted as a group of organizations, both directly and indirectly involved, that are integrated to meet consumer needs, starting from raw materials to the final product in the hands of the final consumer. Mentzer (2001) revealed that the final consumer is also included as a member of the supply chain. Supply chain is a sequence of business processes and activities from suppliers to consumers by providing products, services, and information that aims to achieve customer satisfaction. The business process involves three streams that flow along the supply chain, namely product flow, financial flow, and information flow. The three flows move from each member of the supply chain to the next member up to the final consumer. Products that flow in the chain are not only finished products, but can also be raw products or semi-finished products. The goal of the supply chain is to maximize product flow and create product value for consumers as a fulfillment of needs and value for the company, namely receiving higher profits.

Meanwhile, supply chain management is an integrated philosophy for managing all distribution flows from suppliers to consumers which consists of flows between levels in a supply chain to maximize total profits (Chopra & Meindl, 2007). The concept of supply chain management was first introduced by Oliver and Weber in 1982. Supply chain management aims to overcome problems that occur in supply starting from product availability and fit for use. In addition, inventory control is important for controlling shortages and excesses both in terms of production, supply and demand (Ruslim, 2013).

Anatan & Ellitan (2008) revealed that basically supply chain management has three main objectives, namely reducing costs, reducing capital, and improving services. The Council of Logistics Management defines supply chain management as systematic strategic coordination between the main business

functions in certain companies and other businesses, which are still in the same supply chain, which aims to improve long-term performance or achievements for the company in particular and the supply chain in general. Supply chain design focuses on the location where decisions are made and the objectives of the chain (Mourits & Evers, 1995). According to Chopra & Meindl (2007), there are four drivers in the supply chain, namely inventory, transportation, facilities and information.Businesses in agricultural sectors can spot inefficiencies and potential for cost-savings by understanding the supply chain. They may save costs associated with running their business, increase profitability, and provide clients with competitive pricing by streamlining the flow of goods and information. Supply chain analysis may help agricultural businesses keep an eye on and manage the quality of their products as they are produced and distributed. As a result, customers will always receive items that are of the highest caliber, are secure, and are consistent.

Risks in agriculture include disease outbreaks, market instability, and weather-related disruptions. Companies may apply methods to reduce possible interruptions and losses thanks to supply chain analysis, which assists them in identifying and assessing these risks. Supply chain analysis can aid in achieving sustainability goals. Companies can assess the environmental impact of their supply chain operations and make improvements in areas such as transportation efficiency, waste reduction, and sustainable sourcing of inputs. A well-managed supply chain ensures timely and reliable delivery of products to customers. This contributes to high customer satisfaction levels, repeat business, and positive word-of-mouth referrals. Based on this it is important to analyze the Supply Chain performance from PT. XYZ as one of the Agriculture companies.

RESEARCH METHOD

This research was conducted at PT XYZ, Medan Industrial Zone, North Sumatra. The company is one of the oleochemical companies in Indonesia and has also implemented supply chain management in its business processes. The snowball sampling technique is beneficial if you wish to study a group that is hard to reach or does not have a clear list. Starting with some of the important informants, you can subsequently request them for recommendations for additional persons who might be pertinent to this investigation. The company's marketing division, intermediary traders, collectors, agents, distributors, and retailers are important respondents.

This research utilizes both primary and secondary data. Primary data was obtained through interviews using questionnaires and direct field observations. Secondary data was obtained from PT XYZ's data from 2015-2016, as well as relevant supporting literature such as literature studies, supporting journals, books, and some supporting data provided by relevant institutions. The scope of

this research is limited to the product of 99 percent lauric acid, which is one of the types of fatty acids.

PT. XYZ is a company that has implemented supply chain management (SCM). The performance measurement of the supply chain can be conducted using the SCOR method. This method was introduced by the Supply Chain Council (SCC) as a process reference model for performance measurement in the industrial sector (Bolstroff & Rosenbeum, 2003). SCOR is a method that presents a unique framework of business processes, performance indicators, best practices, and technologies to support communication and collaboration among partners in the supply chain. Therefore, it can enhance the effectiveness of supply chain management and refining the supply chain (Paul, 2014).

SCOR is used to measure and improve supply chain performance by many companies (Honggeng et al., 2011), but is not suitable for the construction industry and is more widely followed by manufacturing companies (Persson et al., 2009), (Prakash et al., 2013) and (Delipinar & Kocaoglu 2016). The SCOR model is used to link the company's business objectives with logistics operations. And the SCOR model is a common communication language to members of the supply chain that uses it (Salazar et al., 2012).

Bolstorff & Rosenbaum (2012) state that in SCOR, supply chain management is defined as the integrated processes of planning, sourcing, making, delivering, and returning from suppliers to customers or end consumers. It is supported by operational strategies, material flow, labor, and information. SCOR divides supply chain processes into five: plan, source, make, deliver, and return. Generally, measurement using this method is divided into three stages of process mapping, namely level one, level two, and level three (SCC, 2015). The three levels of processes are explained as follows:

1. Level one is the level that defines the scope and general definition of the five core processes.
2. Level two is the configuration level and is closely related to the categorization of processes. At this level, processes are aligned with supply chain strategies.
3. Level three is the level of decomposing the existing processes within the supply chain into elements that define the company's capabilities for competition.

The performance matrix measured in this research refers to the objectives to be achieved by the company and is adjusted to the research scope. The parameters measured in this study include:

1. Perfect Order Fulfillment (POF)

POF stands for Perfect Order Fulfillment, which is the percentage of customer orders that are delivered perfectly. It can be calculated systematically as follows:

POF = (Total Perfect Orders / Total Orders) x 100%

2. Order Fulfillment Cycle Time (OFCT)

OFCT stands for Order Fulfillment Cycle Time, which is the amount of time required from order receipt to product arrival at the customer. The value of OFCT can be measured by calculating the average number of days it takes to deliver 99 percent lauric acid to customers. The calculation includes the time strat from the customer places an order for 99 percent lauric acid, the production lead time, and the shipping duration, until the product is received by the customer.

3. Cash to Cash Cycle Time (CTCCT)

CTCCT stands for Cash-to-Cash Cycle Time, which is the time between a company paying for materials to suppliers and receiving payment from customers. This matrix is used to measure the supply chain speed in converting inventory into cash. The values in this metric are used to assess the financial health of a company. Systematically, it can be calculated as follows:

CTCCT = Inventory days of supply + Days sales outstanding - Days payable outstanding.

Performance attributes, metrics, and company achievements are presented with actual data and benchmark data, which represents the performance data of similar companies used as a comparison for the actual data (as shown in Table 1).

Table 1.   Matrik Supply Chain and Units

Performance Attribute	Matrix	Actual Data	Benchmark Data
Supply chain reliability	POF	%	%
Supply chain responsiveness	OFCT	Day	Day
Supply chain asset management	CTCCT	Day	Day

Source: (chosen) Bolstroff & Rosenbeum (2003)

The Researchers who have used the SCOR method in measuring supply chain performance such as Bellerina (2009); Setiawan et al. (2010); Kersten & Saeed (2014); Munajat & Santosa (2014); Nugraha et al. (2016); Delipinar & Kocaoglu, 2016), these researchers focused on performance calculations at level one. However, Mutakin & Hubeis (2011) and Luthfiana & Perdana (2012) conducted performance calculations using the SCOR method with an analysis from level one to level three. The steps of the Scor supply chain analysis approach are as follows:

1. Identifying the supply chain's primary process (definition of the scope): By determining the primary process in PT. XYZ's supply chain, you can determine the analysis's scope. Determine the crucial steps in each procedure.
2. Build a flowchart for each process identified in PT. XYZ's supply chain using process mapping (process mapping). Identification of the parties engaged in

each process phase, including customers, suppliers, producers, and distributors.

3. Establish a key performance indicator (KPI) that is pertinent to each supply chain process for performance measurement. Gather information about KPIs to assess performance currently.

4. Analysis of performance: Finding areas where results fall short of goals or objectives

5. Identify improvement possibilities based on the findings of the performance study. Create a strategy for improvement that outlines specific actions you will take to boost supply chain efficiency.

RESULT AND DISCUSSION

General Description

A palm oil processing sector that can raise the added value of the outcomes is the oleochemical industry. This chance was the catalyst for the creation of PT. XYZ. PT. XYZ is an integrated oil palm-based subsidiary of one of Indonesia's biggest consumer firms. PT. XYZ produces oleochemical products in two main categories: solids (particularly for the group of fatty acid products) and fluids (particularly for the glycerin group). Products that are solid are classified into two categories: flakes and grains (beads). Both domestically and internationally, PT. XYZ markets its oleochemical goods. Products are shipped, among other countries, to Japan, Korea, Taiwan, and almost 90% of the world.

Products are shipped to a number of nations, including the United States, Europe, the Middle East, Japan, Korea, Taiwan, and others, in the amount of around 90%. The remaining 10% is distributed to domestic or local businesses. With a capacity of 220,000 tons per year, or 88.00 percent of the business's overall production capacity of 250,000 tons, fatty acids is the product that the company produces in the greatest quantity. Fatty acids are made from PKO, which is the byproduct of manufacturing palm kernel oil. The organization provides a solution to the market's rising need for oleochemical goods. Additionally, this was done to improve raw material absorption. In addition, this was done to increase the absorption of raw materials. Widely available so that it can be utilized and obtain high added value. The expansion of the downstream oil palm business is inextricably linked to the growth of the aforementioned firm. It is anticipated that the government would promote the expansion of the downstream oil palm business through the policies it issues.

These policies include the government's updated policy on palm oil products, which helps the downstream industry flourish even more and, conversely, does not make it easier for exports of palm raw materials. In order to promote investment in the downstream oil palm industry sector, the government has also released tax incentive programs, such as tax holidays and tax allowance

policies. Since the government strategy was released, numerous businesses have increased their business from both existing local businesses and from outside sources. Naturally, this growth will result in an increase in production capacity and a variety of downstream goods. It is predicted that the company's further expansion would have an impact on the performance of the chain of command.

Performance can be used as one of the evaluation measures in an organization, company, or supply chain. The purpose of measuring performance is to assess whether the ultimate goals of the organization, company, or supply chain have been achieved as intended or not.

Mapping Level One

In Mapping Level One, PT. XYZ has only one supply chain flow consisting of suppliers, PT. XYZ, and customers. The supply chain flow diagram of PT. XYZ is shown in Figure 1. The supplier focused on is the raw material supplier, specifically limited to PKO (Palm Kernel Oil) raw material. The supplier company is the sole supplier, meaning as the only company that supplies PKO to PT. XYZ.
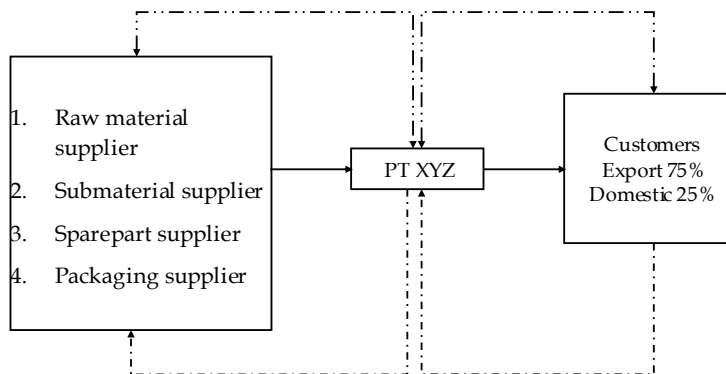

Figure 1.
Supply Chain Model of PT XYZ

Note:
⟶ Goods flow; ◀┄▶ Information flow; ┄·┄▶ Money flow

The supplier is a company within the same group as PT. XYZ. On the other hand, PT. XYZ is a manufacturing company operating in the oleochemical sector, producing fatty acids, glycerine, and soap noodles. However, the focus of this research is on 99 percent lauric acid, which is one of the products classified as a type of fatty acid. PT. XYZ's customers are downstream companies, particularly in the cosmetics industry, that use oleochemical products as raw materials. PT. XYZ's customers are divided into two categories: export destination customers and domestic customers, with sales percentages of 75 percent and 25 percent, respectively. The sales percentages are based on the Directorate General of Customs and Excise Regulation PER 35/BC/2013, as PT. XYZ is located in a

Bonded Zone. An existing topographical map and an existing thread diagram can both be used to display the present setup. The firm obtains raw materials from its plantations, which are handled by the company, and buys garden products from conventional gardens, which are managed by the company (Sarjono et al., 2022).

Bonded Zone is a designated area, building, or facility with specified boundaries where activities such as manufacturing, processing of goods and materials, design and engineering, sorting, preliminary inspection, final inspection, and packaging of imported goods or domestic goods are carried out, primarily for export purposes (Peraturan Pemerintah No. 33 1996).

Plan

Plan is crucial in any company. This process marks the initial determination of procurement, production, and delivery. It involves inventory planning and control (raw materials, support materials, spare parts, and packaging), production planning, delivery planning, also aligning all supply chain flows with financial flows. Darojat & Yunitasari (2017) state that this process is one that should get attention because it has the lowest performance value.

PT. XYZ primarily sources its main raw materials domestically. The supplier of PKO raw materials for PT. XYZ is the sole supplier, and the supplier's location is not far from PT. XYZ's location. On average, there are 44 orders placed per month, with a total average monthly order quantity of 5,600 tons.

Source

The procurement process involves scheduling deliveries from suppliers for raw materials, support materials, spare parts, and packaging. It includes the processes of receiving the goods, conducting inspections, granting payment authorization for the delivered items, selecting suppliers, and evaluating supplier performance. Hartati et al (2017) research results that this process has the lowest performance compared to other processes. Nurfitrasari (2011) and Hanugrani et al. (2013) focused improvement on the raw material supply process.

PT. XYZ's raw material procurement system utilizes the make-to-stock method. The production process from PKO to 99 percent lauric acid and 99 percent myristic acid involves splitting and fractionation processes. On average, PKO usage as a raw material amounts to 5,577.28 tons per month. The production of main products at PT. XYZ follows the make-to-order method, meaning they are produced according to customer orders.

Make

The Make process involves transforming raw materials into a product that customers want. The production process is based on sales forecasts made by the marketing division and customer orders. The simplified flowchart of the 99 percent lauric acid production process is shown in Figure 2.
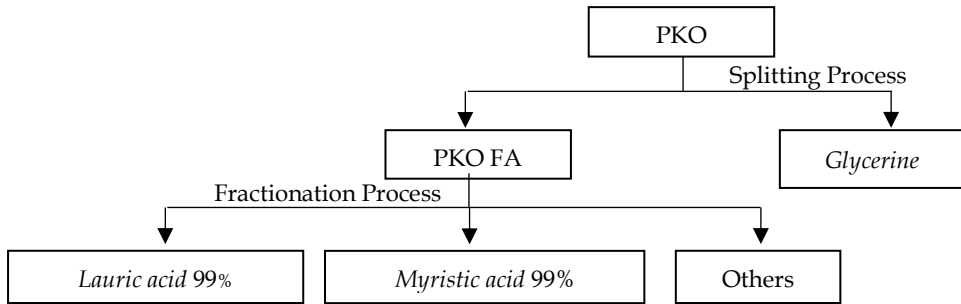

Figure 2.
Lauric Acid 99 Percent Production Process and Myristic Acid 99 Percent

The activities involved in the production process include production scheduling, production timing, production activities, product testing (if the product is new or has different specifications from the last products), and maintenance of production factors.

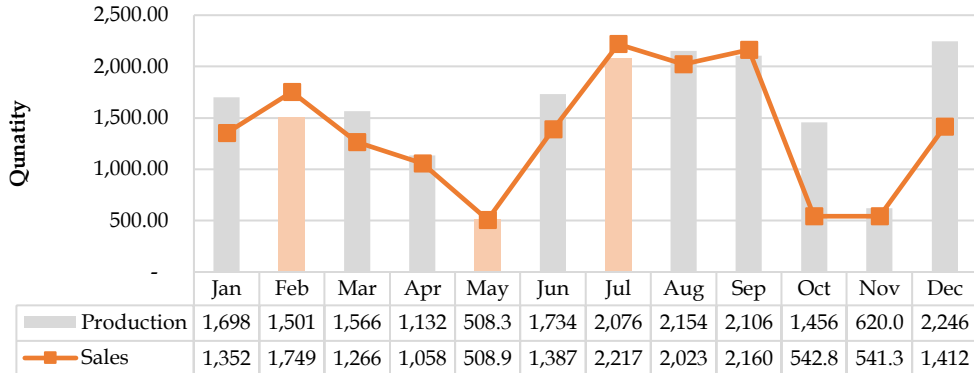|	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Production	1,698	1,501	1,566	1,132	508.3	1,734	2,076	2,154	2,106	1,456	620.0	2,246
Sales	1,352	1,749	1,266	1,058	508.9	1,387	2,217	2,023	2,160	542.8	541.3	1,412

Figure 3.
Production and Selling Chart of Lauric Acid 99 Percent, 2016 (Tons)
Source: PT XYZ (processed)

In the production process, the use of PKO as a raw material not only results in one main product but also in secondary products. In addition, to producing 99 percent lauric acid as the main product, the company also produces 99 percent myristic acid, semi-finished products, and residues (the semi-finished products and residues are labeled as "others" in Figure 2.). This research will focus on explaining two fatty acid products, namely 99 percent lauric acid and 99 percent myristic acid.

The average monthly production of 99 percent lauric acid during the year 2016 was 1,566.89 tons, with the highest production occurring in December at 2,246.98 tons. However, the highest sales volume did not occur in December but in July, with a total of 2,217.53 tons. The fluctuation of production and sales data for 99 percent lauric acid can be observed in Figure 3.

The packaging used for the products to be shipped is customized by the customers self. The types of packaging used for 99 percent lauric acid products include iso tanks, tankers, 20 kg paper bags, 25 kg paper bags, 600 kg jumbo bags, and 25 kg woven bags. The production and sales volumes of 99 percent lauric acid in 2015-2016 are presented in Table 2.

Table 2.   Lauric Acid 99 Percent Sales, 2015-2016

Product	Production (Tons)		Pert (%)	Sales (Tons)		Pert (%)
	2015	2016		2015	2016	
Lauric acid 99 percent	17,421.05	18,802.64	7.93	17,989.46	16,221.11	(9.83)

Note: Pert is the percentage change from 2015 to 2016
Source: PT XYZ (processed)

From Table 2., it can be observed that the percentage change in the production volume of lauric acid 99 percent over one year increased by 7.93 percent, while there was a decrease in sales by 9.83 percent. In contrast, myristic acid 99 percent also increased in both production and sales by 19.66 percent and 3.39 percent, respectively. The decline in sales was due to several factors, including the presence of the startup companies in the oleochemical industry.

Delivery

The delivery process is the most important activity to fulfill customer demands for a product. It involves preparing the physical product from the warehouse to the intended location according to the order and delivery documents, ensuring the product handling requirements are in appropriate condition. The activities involved in the delivery process at PT. XYZ include order management for both supplier orders and customer orders, transportation (selecting the mode of transportation), and distribution. Distribution is seen as a key (physical) link between the internal supply chain activities of the company and the customers (Rexhausen et al., 2012).

The transportation used by PT. XYZ to deliver its products are container trucks, tankers, and sea vessels. Container trucks and tankers are employed for local deliveries to customers located near the company or in areas accessible by land routes. For deliveries to local customers outside of Sumatra island and for export destinations, shipping is done using sea vessels from the Belawan Port. Prior to that, the products are transported from the company to the port using

container trucks or tankers. PT. XYZ commonly utilizes 20 ft and 40 ft containers. The scope of the SCOR process elements can be found in Table 3.

Table 3.   The Scope Of the SCOR Process Elements

Process Elements	Supplier	PT. XYZ	Customer
Planning	PKO raw material and financial planning	PKO requirements and inventory planning, production, and distribution.	Product planning purchases, inventory, product usage (lauric acid)
Source	Procurement of raw materials according to customer demand, both in terms of quality and quantity and making agreements with PT XYZ	Supplier selection, making agreements with suppliers, ordering, distribution, inspection, and withdrawal of raw materials from suppliers	Direct purchase of products (lauric acid) from PT XY.
Production	Converting palm fruit into PKO	Producing lauric acid and packaging it according to customer demand.	The customers are the end users of lauric acid.
Delivery	Distributed PKO raw materials to PT XYZ	Loading materials into containers, ensuring fast timely transportation, managing the order process, and maintaining good customer relationships.	Not performing the delivery process because the customers are end users.
Returning	Managing raw materials returns that do not comply with PT XYZ's requests related to quality and providing transportation for the distribution of replacement raw materials.	Making claims on non-conforming raw materials to suppliers. Replacing raw materials that are not in accordance with PT XYZ's request.	Making claims for products that are damaged, lacking in quantity, dirty, or not in accordance with the request.

Source: PT XYZ (processed)

SCOR Performane Matrix

Performance measurement in a company is used to assess whether the supply chain in that company is performing well or not. One of the methods used in measuring supply chain performance is SCOR. The supply chain of PT. XYZ will be measured using level 1 performance metrics, specifically the distribution performance of lauric acid from PT. XYZ to the customer. The level one analysis begins with defining the company's business objectives (Bolstorff & Rosenbeum, 2003). The Supply Chain Operations Reference Model was developed by the Supply-Chain Council to offer a standard framework for evaluating, tracking, and enhancing supply chain performance. The Supply Chain Operation

Reference (SCOR) model (SCC) was developed by the Supply Chain Council. A framework called SCOR is used to describe supply chain processes from suppliers to customers. Three essential management components are included in this strategy: process measurement, benchmarking, and business process reengineering (Rosyidah et al., 2022). This is to ensure that the research aligns with the company's strategy and focuses on the main goals the company wants to achieve. Based on the interview results, the business objectives of PT. XYZ are defined as follows:

1. Providing the best service to customers.
2. Increasing the company's profitability.

However, this research only measures performance on attributes that assess the best level of service to customers (business objective 1). This is done because the company's orientation is more focus on customer satisfaction. PT. XYZ' SCOR level 1 matrix performance can be seen in Table 4.

Table 4.   SCOR Model level 1 Matrix

Performance Attributes	Matrix	Actual[a]	Superior[b]	Adv[c]	Parity[d]
Supply chain reliability	POF	87.14%	99 %	90.8%	80%
Supply chain responsiveness	OFCT	44 days	46 days	73 days	99 days
Supply chain asset management	CTCCT	51 days	25 days	41 days	62.5 days

Source: (a) PT XYZ (processed), (b), (c), (d) chosen from SCC (2010), Mutakin (2010)

Considering PT. XYZ's business objective of providing the best service to customers, the reliability attribute is crucial. PT. XYZ aims to achieve a superior value of 99 percent for this attribute. Unfortunately, the actual achievement of PT. XYZ in 2016 was only 87.14 percent. The difference between the actual performance and the expected target for the POF metric is 13.61 percent. As well as the results of research by Wahyuniardi et al. (2017) and Sutawijaya (2016), the results of the POF matrix are below the target.

Mapping Level 2

The mapping level 2 of SCOR, each process in the company's supply chain will be presented in more detail. There are three types of SCOR processes: planning, execution, and enabling. PT. XYZ performs all activities in the planning processes (P1-P5), which include plan supply chain (P1), plan source (P2), plan make (P3), plan deliver (P4), and plan return (P5). In the execution processes (S2, M1, M2, M3, D2, D3, and DR1), PT. XYZ engages in source make to order product (S2), make to stock (M1), make to order (M2), engineered to order (M3), deliver make to order (D2), deliver engineered to order (D3), and deliver return defective product (DR1). Additionally, PT. XYZ is involved in enabling processes. In the level 2 mapping, it is observed that the deliver process has the lowest performance.

P1 – Plan Supply Chain
Identification, planning, priority selection, and counting supply chain aggregate needs

| P2–Plan Source Material handling plan and vendors selection | P3–Plan Make HR planning, production process, and Material Production Schedule (MPS) | P4 – Plan Deliver Delivery planning (schedule and ship selection), and standard quality | P5–Plan Return Claim serveice planning from customers |

SUPPLIER

CUSTOMER

S2-Source Make to–Order Product Procurement, service contract, and material delivery

M2–Make to – Order Manufacturing process (Production), packaging according to customers' request

D3–Deliver Engineered to-Order Product Document preparation, ddelivery, DO Printing, and Finished good report

SR1–Return Defective Product Defective product checking, defective product returning, claim report

DR1 - Return Defective Product Customers' claim report, no returns (another alternative is selling at a lower price/diverting customers), defective product replacement

- Create and manage rules for each proce
- Performance assessment
- Manage data, inventory, transportation, assets, and supply chain configuration
- Identify the elements of the production process

Plan   Make   Deliver   Return
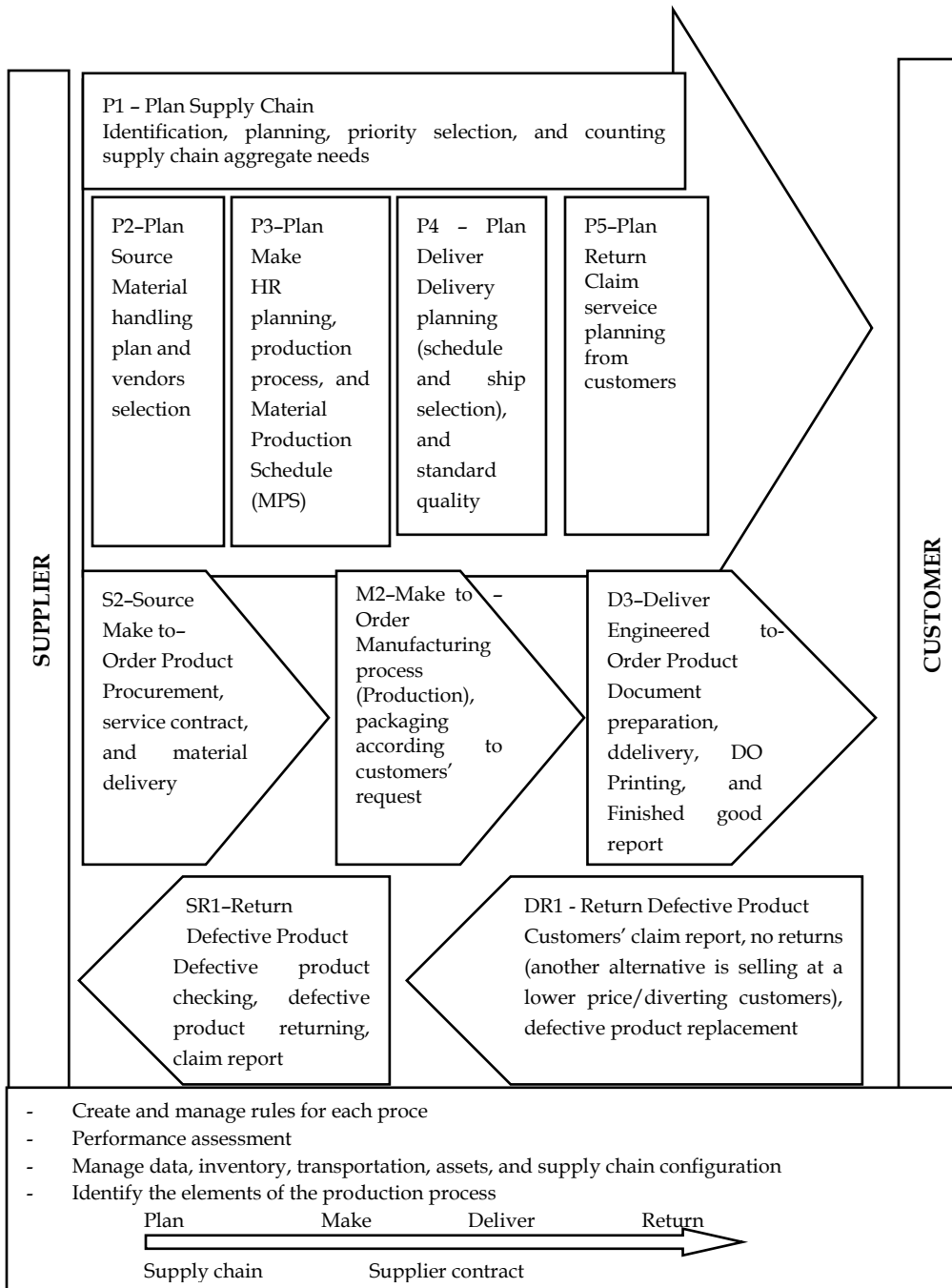
Supply chain   Supplier contract

Figure 4.
Mapping Level 2

The measurement of the supply chain at level two is done by identifying the POF and OFCT metrics that show poor performance. In the calculation of POF and OFCT, key factors to consider are timeliness and quantity accuracy, also

known as on-time in full (OTIF), completeness of supporting documents, and product condition. If any of these points are unfulfilled, it can be said that PT. XYZ's service to customers is inadequate. According to the data from PT. XYZ (2017), some reasons for the imperfect fulfillment of orders to customers include untimely deliveries and product condition receipts by customers.

The causes of untimely deliveries can be traced from upstream to downstream in the process of production, including source, make, and delivery processes. In the source process, the POF value is at 99.88 percent. This percentage represents the comparison of the raw material orders that can be fulfilled by the supplier effectively in 2016. The OFCT value is approximately two days.

In the make process, the POF value is nearly 100 percent. This value is obtained based on the estimated percentage of raw material availability in storage tanks that can fulfill the production process requirements at any time. The high make value is supported by the location of the raw material storage tanks and the supporting materials within the same complex as the factory location. Additionally, the supplier's location is not far from the factory, with a distance of approximately eight (8) km from PT. XYZ to the supplier's location. The OFCT value is less than one day.

On the other hand, in the delivery process, the POF value is 88.36 percent. This value is based on the estimated percentage of accurate delivery in terms of quantity and product condition compared to customer demand. The OFCT value is around 44 days. The POF and OFCT values in the source, make, and deliver processes can be seen in Table 5.

Based on Table 5., it can be concluded that among the three processes - source, make, and deliver - the deliver process has the lowest value compared to the other processes, with a POF value of 88.36 percent and an OFCT of 44 days. This indicates that in terms of fulfilling customer demands in terms of time, quantity, and condition of product, the deliver process is performing inadequately.

Table 5.   POF and OFCT Value On Source, Make, and Deliver Processed

Matrix	Source	Make	Deliver
POF (%)	99.88	100	87.14
OFCT (hari)	2	<1	44

Source: PT XYZ (processed)

Upon further investigation, it appears that the main cause of delays and product not as expected as costumer requested is occurring during the loading process. The company has received several complaints, including instances where the product arrival does not match the specified time, incorrect quantities of products, damaged packaging, wet products, deformed product, and dirty products. The delays happened due to the lateness arrival of product at the port

for loading onto the transportation vessel, as a consequence, waiting for the next ship schedule. The OFCT value of 44 days represents the total duration start from the products are ordered until they arrive at the customer's location. It adjust by the distance and the vessel used for shipping. The failure to deliver products accurately according to customer requested can hinder the company's objective to providing excellent customer service.
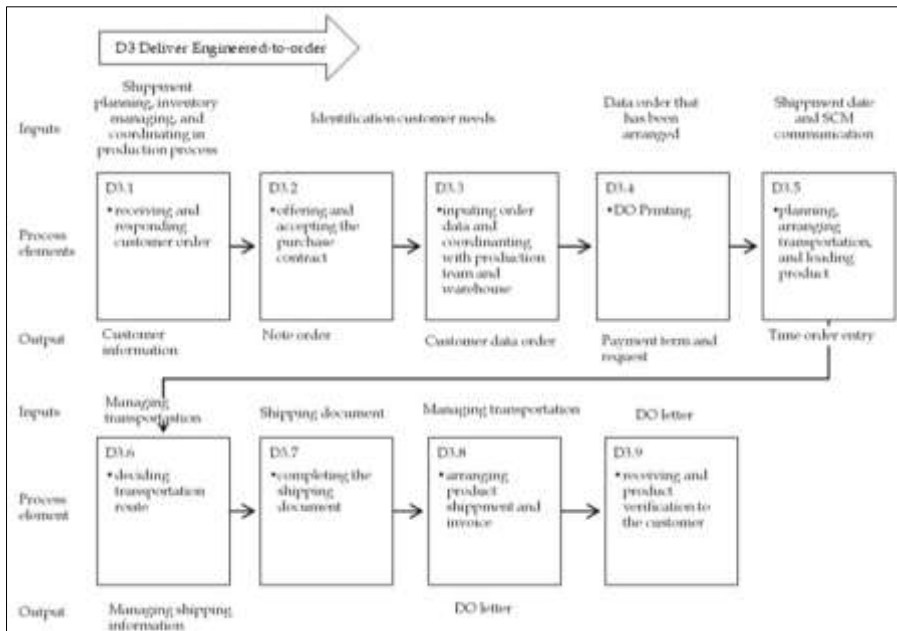
Mapping Level 3

Figure 5.
Mapping Level 3

Mapping level 3 aims to provide a more detailed view of the delivery processes, which had the lowest value compared to the source and the make processes in the level two mapping. The level three mapping illustrates all theactivities involved in the delivery process at PT. XYZ (Figure 5).

CONCLUSION AND SUGGESTION

Conclusion

PT. XYZ has a short supply chain consisting of the supplier, the company (PT. XYZ), and the customers. Based on the metrics at level one measurement, the result obtained, POF = 88.36 percent, OFCT = 44 days, and CTCCT = 51 days. At level two, PT. XYZ engages in activities related to planning processes (P1-P5), executing processes (S2, M1, M2, M3, D2, D3, and DR1), and enabling processes. The level two mapping revealed that the deliver process has the lowest

performance compared to the source and make processes. Subsequently, an analysis was conducted at level three to provide more detailed explanation of the deliver process with the lowest performance. PT. XYZ has implemented SCM effectively by implementing all five core management processes of SCM, namely plan, source, make, deliver, and return, which results in overall integrated supply chain elements and relatively good performance. However, there appears to be a lack of focus on the loading process, which is the initial stage of the delivery process, as indicated by the POF metric.

Suggestion

The supply chain's many responsibilities, such as system implementation, time management, and human resources, should all be the focus of PT XYZ. Controls must be in place for each operation, and staff must be regularly trained in their particular divisions. The techniques concentrated on using proper agricultural and handling techniques, pricing palm oil based on quality, and using an information system to increase supply chain effectiveness (Marimin et al., 2020). It would be advantageous for the business to install a web-based application that supports sales operations, manages total product inventory in terms of kind and amount, and records arrival and customer claim information in order to react rapidly to customer claims. The research's implications can be seen in encouraging the use of technology to achieve transparency, particularly with regard to the cost, quality, and traceability of fresh fruit bunches, the establishment of a policymaker monitoring system, and financial support for independent oil palm smallholders (Heryani et al., 2022).

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