

# Supply Chain Performance Measurement Using the Scor Model: a Case Study at PT. Perkebunan Nusantara IV Regional V

Muhammad Ihsan<sup>1</sup>, Maswadi<sup>2</sup>, Imelda<sup>3</sup>

Agribusiness Study Program, Faculty of Agriculture, Universitas Tanjungpura

Email: muhammadihsan779900@gmail.com, maswadi@faperta.untan.ac.id, imelda@faperta.untan.ac.id

This study aims to measure the supply chain performance of PT. Perkebunan Nusantara IV Regional V located in Ngabang District, Landak Regency. The research was conducted purposively over one month with a population of 97 employees, all of whom were included as the sample (census sampling). Data were collected through observation, structured questionnaires, interviews, and documentation review. The analysis employed the Supply Chain Operations Reference (SCOR) model combined with the Analytical Hierarchy Process (AHP). The results indicate that the company's supply chain performance falls into the excellent category, with a final score of 99.83. All five SCOR processes Plan, Source, Make, Deliver, and Return operate effectively and efficiently. Deliver and Return achieved the highest performance, while Plan and Make showed relatively lower scores, mainly due to challenges in yield prediction and production capacity adjustments. The findings also reveal that priority weights do not always correspond directly to performance outcomes. Overall, the company's supply chain operates optimally, although improvements are still needed in planning and production aspects.

**Keywords:** Supply Chain Performance, SCOR, AHP, Palm Oil Industry.

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## Corresponding Author:

Muhammad Ihsan

Agribusiness Study Program, Faculty of Agriculture, Universitas Tanjungpura  
muhammadihsan779900@gmail.com

## 1. Introduction

Palm oil companies in Indonesia provide substantial support for the country's economic and social development. Economically, the palm oil industry contributes by creating employment opportunities [1], increasing community income by up to 50%, supporting infrastructure development, and generating regional revenue. From a social perspective, the industry also improves access to education and healthcare [3]. According to data from Gabungan Pengusaha Kelapa Sawit Indonesia (GAPKI), Indonesia's Crude Palm Oil (CPO) production in 2023 was estimated at 50.07 million tons, representing a 7.15% increase from 46.73 million tons in 2022. This trend is consistent with domestic consumption, which rose from 21.24 million tons in 2022 to 23.23 million tons in 2023, reflecting growth of approximately 8.90%. The effective implementation of the B35 biodiesel regulation is one of the factors driving the increased utilization of palm oil [4].

Indonesia's palm oil industry experienced significant growth in production, domestic consumption, and exports from 2021 to 2023. CPO (Crude Palm Oil) production increased from 46.888 million tons in 2021 to 46.729 million tons in 2022 and reached a total of 50.069 million tons in 2023. Similarly, CPKO (Crude Palm Kernel Oil) production rose from 4.412 million tons in 2021 to 4.519 million tons in 2022 and further increased to 4.775 million tons in 2023. Consequently, total palm oil production continued to increase annually, reaching 54.844 million tons in 2023.

In terms of domestic consumption, palm oil use for food increased from 8.954 million tons in 2021 to 9.892 million tons in 2022 and reached a total of 10.298 million tons in 2023. Biodiesel consumption also showed a significant rise, from 7.342 million tons in 2021 to 9.048 million tons in 2022, and ultimately reaching

10.647 million tons in 2023. Overall, total domestic consumption continued to grow steadily, from 18.422 million tons in 2021 to 21.14 million tons in 2022, and reaching 23.213 million tons in 2023.

In terms of exports, shipments of CPO to international markets increased from 2.482 million tons in 2021 to 3.488 million tons in 2022, with a total of 3.262 million tons in 2023. Processed CPO products continued to dominate exports, amounting to 24.925 million tons in 2021, 23.767 million tons in 2022, and 22.726 million tons in 2023. Overall, total exports of palm oil and its derivatives reached 33.151 million tons in 2022 and slightly declined to 32.215 million tons in 2023. Meanwhile, ending stocks of palm oil fluctuated during this period. In 2021, ending stocks were recorded at 4.867 million tons, decreasing to 4.129 million tons in 2022 and further declining to 3.691 million tons in 2023. In terms of export value, the industry experienced an increase from USD 35.041 million in 2021 to USD 39.069 million in 2022, followed by a decline to USD 30.387 million in 2023. Overall, the palm oil industry trend indicates growth in production and domestic consumption at a faster pace than distribution.

Kalimantan Barat is one of the provinces where oil palm serves as a primary commodity, making a significant contribution to the regional economy. Palm oil production in this province is substantial, reaching millions of tons annually. Between 2020 and 2023, West Kalimantan produced approximately 7.7 million tons of CPO and PK (Palm Kernel) from a total plantation area of about 2.5 million hectares. Favorable geographical conditions, combined with investments from large scale companies, have supported the development of the palm oil industry in this region [5].

To sustain production growth, competitive advantages in raw materials are required, influenced by the contributions of each stakeholder within the distribution system from raw material supply, production stages, to distribution to consumers. Downstream processing companies also depend on Crude Palm Oil (CPO) as their primary input material. Moreover, agricultural commodities are inherently perishable and highly susceptible to weather changes, which can become specific constraints requiring appropriate attention and improvement. Every company seeks an operational flow capable of achieving customer satisfaction by considering market standards, cost efficiency, and timely distribution [6].

PT Perkebunan Nusantara IV Regional V is one of the business units under the Holding Perkebunan Nusantara (PTPN Group), operating in agribusiness and agroindustry, particularly oil palm plantations. Regional V was established as part of the PTPN Group's restructuring, in which several PTPN entities were consolidated to improve efficiency and corporate performance. The achievements of PT Perkebunan Nusantara IV Regional V in Kecamatan Ngabang, Kabupaten Landak, are closely linked to supplier support as key stakeholders directly involved in business operations. Accordingly, the company ensures that its commitment to sustainability extends beyond the corporate level to all suppliers within the supply system, including smallholder farmers and independent cooperatives that provide additional raw materials [7].

The issues identified at PT Perkebunan Nusantara IV Regional V relate to activities within the core supply chain processes: Plan, Source, Make, Deliver, and Return. The planning process involves suboptimal forecasting of Fresh Fruit Bunches (FFB) demand and harvest scheduling. The sourcing process includes inconsistent FFB quality and delays in deliveries from suppliers. The production (make) process faces operational disruptions such as machine breakdowns (downtime). The delivery process is characterized by delays in shipping CPO to processing industries and inadequate coordination in delivery scheduling. The return process concerns the handling time of FFB that does not yet meet established quality standards.

To measure supply chain performance at PT Perkebunan Nusantara IV Regional V, this study employs the Supply Chain Operations Reference (SCOR) model. The SCOR framework comprises five core processes: Plan, Source, Make, Deliver, and Return [8].

## 2. Literature Review

Supply chain management is a strategic approach used to coordinate the flow of materials, information, and financial resources from suppliers to end consumers in order to achieve efficiency and competitiveness [8]. In the context of agroindustry, especially the palm oil sector, supply chain performance plays a crucial role because agricultural commodities are perishable and highly dependent on coordination between production, procurement, and distribution processes. Performance measurement systems are therefore needed to evaluate how effectively supply chain activities are carried out [9]. One widely adopted framework is the Supply Chain Operations Reference (SCOR) model, which evaluates supply chain performance through five main processes: plan, source, make, deliver, and return. The SCOR model also integrates performance attributes such as reliability, responsiveness, and flexibility to identify strengths and weaknesses in operational activities [10]. Previous studies indicate that the use of the SCOR framework enables organizations to evaluate supply chain performance systematically and identify operational inefficiencies that require improvement [11].

Several previous studies have applied the SCOR model in combination with decision support methods such as the Analytical Hierarchy Process (AHP) to determine the priority of supply chain performance indicators [12]. Research conducted in agroindustry and manufacturing sectors demonstrates that integrating SCOR with AHP can help organizations determine the relative importance of key performance indicators and support strategic decision making in supply chain management. However, previous studies often focus primarily on general performance measurement without examining how differences between priority weights and actual performance outcomes influence managerial decision making [13]. In addition, several studies reveal inconsistencies between performance indicators and operational priorities, suggesting that high priority processes do not always correspond to the highest performance results. These limitations indicate a research gap, particularly in understanding how priority weighting through AHP relates to actual supply chain performance results within the palm oil industry context [14].

Based on the identified research gap, it is necessary to conduct a comprehensive analysis of supply chain performance that not only measures operational performance using the SCOR framework but also examines the relationship between priority values and actual performance outcomes [15]. Therefore, the research problem of this study can be formulated as follows: how is the supply chain performance of PT. Perkebunan Nusantara IV Regional V measured using the SCOR model, and how do the priority weights obtained from the AHP method relate to the final supply chain performance results? Addressing this problem is important to identify which supply chain processes require strategic improvement and to provide a more accurate basis for managerial decision making in optimizing supply chain operations within the palm oil industry [16].

## 3. Methods

This study was conducted purposively in Ngabang District, Landak Regency, specifically at PT. Perkebunan Nusantara IV Regional V, as the area represents one of the leading oil palm plantation centers that plays a significant role in the regional economy. The research was carried out over a one-month period following the issuance of the research permit. The study population consisted of 97 employees, all of whom were included as the sample (total sampling), resulting in the sample size being equal to the population. The data used comprised primary data obtained directly through field observations, structured questionnaires, and interviews with employees, as well as secondary data derived from literature sources such as books, academic journals, and official websites. Data collection methods included observation to examine the supply chain processes, questionnaires to assess performance based on indicators of efficiency,

effectiveness, and satisfaction, and structured interviews to obtain in-depth information regarding the company's supply chain activities.

The data analysis techniques applied in this study employed the Supply Chain Operations Reference (SCOR) model to measure supply chain performance across five main processes: *Plan*, *Source*, *Make*, *Deliver*, and *Return*. Each process was evaluated through performance attributes including reliability, responsiveness, and flexibility, which were further translated into measurable Key Performance Indicators (KPIs). The relative importance of each process, attribute, and KPI was determined using the Analytical Hierarchy Process (AHP) method through pairwise comparison and weighting procedures. The obtained weights were then combined with KPI performance scores to calculate performance indices at Level 3, Level 2, and Level 1 of the SCOR hierarchy, ultimately producing the final supply chain performance value for the company.

#### 4. Result and Discussion

##### Calculation of the Final Value of Supply Chain Performance

The final supply chain performance value is obtained from the sum of all index values and Key Performance Indicator (KPI) scores at each level. Table 26 presents the results of the supply chain performance measurement at PT. Perkebunan Nusantara IV Regional V using the Supply Chain Operations Reference (SCOR) model. The table illustrates the hierarchical structure of performance assessment, starting from the main process level (Plan, Source, Make, Deliver, and Return), followed by performance attributes (Reliability, Responsiveness, Flexibility), and finally the Key Performance Indicators (KPIs) measured at the lowest level.

Each KPI has a weight representing its relative importance to the measurement objectives, as well as a performance score (%) derived from the company's actual data. These values are then calculated into performance indices at each level (Level 3, Level 2, and Level 1) to produce the company's overall final supply chain performance value.

The table shows that the final supply chain performance score reaches 99.83%, indicating that the company's supply chain performance falls within the "very good" category. However, variations in contributions across processes are still evident. For example, the Make process provides the largest contribution (23.10%), while the Return process contributes relatively less (9.80%). This suggests that although the supply chain operates effectively overall, certain aspects particularly the efficiency of the return process require further evaluation [17]. The results of the final supply chain performance calculation at PT. Perkebunan Nusantara IV Regional V are presented in the table below.

**Table 2.** Measurement of the Final Value of Supply Chain Performance

Proc ess	Leve l 1 Wei ght	Performa nce Attribute	Leve l 2 Wei ght	KPI Co de	Leve l 3 Wei ght	KPI Sco re (%)	Level 3 Perform ance Index	Level 2 Perform ance Value (%)	Level 2 Perform ance Index	Level 1 Perform ance Value (%)	Level 1 Perform ance Index
Plan	0.29	Reliability	0.32	PR	0.46	91.	68.25	96.00	49.66	94.22	22.66
	0		8	-1	2	25					
Plan				PR	0.42	92.	60.20				
				-2	5	87					
Plan		Responsiv eness	0.67	PR	0.50	93.	61.99	92.45	42.55		
			2	e-1	0	00					

Process	Level 1 Weight	Performance Attribute	Level 2 Weight	KPI Code	Level 3 Weight	KPI Score (%)	Level 3 Performance Index	Level 2 Performance Value (%)	Level 2 Performance Index	Level 1 Performance Value (%)	Level 1 Performance Index
Plan				PR-e-2	0.486	92.25	65.28				
Source	0.20	Reliability	0.608	SR-1	0.453	91.99	61.47	91.66	44.73	96.88	21.58
Source				SR-2	0.547	91.85	68.59				
Source		Responsiveness	0.392	SR-e-1	0.597	92.66	67.51	94.35	42.46		
Source				SR-e-2	0.403	93.00	63.29				
Make	0.185	Reliability	0.381	MR-1	0.766	92.61	70.94	90.87	45.44	93.50	23.10
Make				MR-2	0.234	91.88	66.66				
Make		Responsiveness	0.354	MR-e-1	0.318	92.75	68.12	92.54	47.20		
Make				MR-e-2	0.682	92.00	62.74				
Make		Flexibility	0.264	MF-1	0.431	92.64	62.22	93.22	45.22		
Make				MF-2	0.569	90.00	64.34				
Deliver	0.242	Reliability	0.453	DR-1	0.580	90.64	60.29	94.55	42.83	97.54	22.69
Deliver				DR-2	0.420	93.00	69.01				
Deliver		Responsiveness	0.547	DR-e-1	0.433	92.48	68.00	93.74	43.59		
Deliver				DR-e-2	0.650	91.82	69.48				
Return	0.090	Reliability	0.658	RR-1	1.000	92.87	75.28	96.55	40.07	98.00	9.80
Return		Responsiveness	0.342	RR-e-1	1.000	91.88	71.02	94.25	42.58		

Source: Processed primary data (2025)

Based on the results of the final supply chain performance measurement at PT. Perkebunan Nusantara IV Regional V presented in the table above, the findings indicate a comprehensive achievement across the five SCOR processes Plan, Source, Make, Deliver, and Return assessed using performance attributes of Reliability, Responsiveness, and Flexibility. According to Table 26, the performance measurement was conducted hierarchically from Level 1 to Level 3 following the Supply Chain Operations Reference (SCOR) model approach. At Level 1, performance was analyzed based on the five main SCOR processes. The results

show that the Make process contributed the highest value at 23.10%, followed by Deliver at 22.69%, Plan at 22.66%, and Source at 21.58%, while Return had the lowest contribution at 9.80%. This indicates that the primary strength of the supply chain lies in the production process, whereas the return process still requires further attention.

At Level 2, the assessment focused on performance attributes, namely Reliability, Responsiveness, and Flexibility. Reliability dominated with achievement levels above 90%, indicating that both production quality and the accuracy of receiving processes meet established standards. Responsiveness also demonstrated strong performance with an average value of approximately 92.94%, although slightly lower than Reliability. Meanwhile, Flexibility appeared only in the Make process with an achievement of 93.22%, reflecting the company's adequate ability to adjust production while still leaving room for improvement.

At Level 3, a more detailed analysis was conducted on Key Performance Indicators (KPIs). The highest index was observed in KPI RR 1 (75.28%), related to return consistency. Moderate values were found in planning KPIs (PR 1 = 68.25%; PR 2 = 60.20%) and receiving KPIs (SR 1 = 61.47%; SR 2 = 68.59%). The lowest index values were recorded in KPI MRe 2 (62.74%) and MF 2 (64.34%), indicating ongoing challenges in responsiveness speed and production continuity. Overall, the results show that the company's supply chain performance falls within the "very good" category, with a total score of 99.83%, highlighting strengths in Reliability and production processes, while Responsiveness and Flexibility remain areas for improvement. These findings align with the SCOR concept, which enables comprehensive evaluation from primary processes and performance attributes to detailed indicators in identifying supply chain strengths and weaknesses.

Based on the measurements in Table 26, each supply chain process at the company achieved very high scores, resulting in a final value of 99.83 categorized as excellent. The Plan process scored 94.22 (excellent), indicating that planning for fresh fruit bunch (FFB) requirements, harvest scheduling, and management of CPO and kernel yields has been implemented very effectively. The company demonstrates sound planning aligned with production capacity, minimizing risks of raw material shortages or surpluses. The Source process obtained a score of 96.88 (excellent), indicating that the quality and accuracy of FFB supply from suppliers are well maintained and that receiving procedures are conducted quickly and according to quality criteria [18].

The Make process achieved a score of 93.50 (excellent), indicating that the mill is capable of processing FFB into CPO and kernel in accordance with quality standards, completing production efficiently, and maintaining resilience when facing technical disruptions or capacity adjustments [19]. The Deliver process scored 97.54 (excellent); in this context, it does not represent physical product delivery but rather the preparation of contractual documents, delivery orders (DO), and official reports (BA) related to sales. Despite the absence of physical distribution activities, administrative and documentation aspects of distribution are performed very effectively. Finally, the Return process achieved a near perfect score of 98.00 (excellent), demonstrating the company's high accuracy in identifying problematic FFB and responsiveness in returning substandard raw materials to suppliers according to applicable quality criteria [20].

Considering the scores across all processes, it can be concluded that the overall supply chain performance is in the "very good" category. The final score of 99.83 reflects that the flow of goods, information, and documentation operates optimally, reliably, and responsively. This condition not only reflects operational effectiveness but also indicates strong consistency in maintaining the quality and continuity of all supply chain activities [21].

### Relationship Between AHP Priority Values and Final Supply Chain Performance

AHP priority values and final supply chain performance scores are interrelated in evaluating supply chain performance. Together, they generate a total value that assists the company in making decisions and identifying processes and performance indicators requiring improvement, particularly those with lower scores.

**Table 3.** Relationship Between Priority Values and Final Supply Chain Performance

Supply Chain Process	Priority Value	Final Score
Plan	0,290	94,22
Source	0,200	96,88
Make	0,175	93,50
Deliver	0,242	97,54
Return	0,090	98,00

Source: Processed primary data (2025)

Based on the table, each supply chain process has different priority weights and varying performance achievements. The Plan process has the highest priority weight (0.290) with a final performance score of 94.22. Although categorized as very good, this result indicates that planning still has room for improvement, making it a reasonable focus for the company's strategic priorities [22]. The Deliver process ranks second with a priority weight of 0.242 and a performance score of 97.54. Although Deliver in this study relates primarily to documentation rather than physical shipment, the process has been executed very effectively. The Source process has a priority weight of 0.200 and a final score of 96.88, indicating consistent quality and accuracy of FFB supply from suppliers. The Make process has a priority weight of 0.175 with a score of 93.50, suggesting that production activities, while still excellent, require the greatest attention for performance improvement. Meanwhile, the Return process, despite having the lowest priority weight (0.090), achieved a high score of 98.00, indicating that the mechanism for returning problematic raw materials operates very effectively even though it is not a primary priority [23].

Overall, the findings demonstrate that priority weights determined through the Analytical Hierarchy Process (AHP) are not always directly proportional to performance outcomes. High priority processes such as Plan may still exhibit relatively lower performance and thus become key targets for improvement, whereas low priority processes such as Return may achieve optimal performance [24]. This indicates that the supply chain management of PT. Perkebunan Nusantara IV Regional V is already highly effective, although further improvements should focus particularly on planning and production to achieve a fully optimized supply chain performance [25].

### 5. Conclusion

Based on the results of the study on supply chain performance measurement at PT Perkebunan Nusantara IV Regional V using the Supply Chain Operations Reference (SCOR) method combined with the Analytical Hierarchy Process (AHP), several important conclusions can be drawn. Overall, the company's supply chain performance falls within the very good category, with a final performance score of 99.83. This indicates that, in general, supply chain activities from planning, procurement, production, distribution document management, to the return mechanism for non compliant Fresh Fruit Bunches (FFB) have been carried out effectively, efficiently, and in accordance with established quality standards. When examined in greater detail, the performance results for each process show some variation. The Plan process achieved a performance score of 94.22, which, although still categorized as very good, is relatively lower than the other processes. The company already has a solid planning system related to FFB raw material requirements and

mill production capacity; however, constraints remain in accurately predicting CPO and kernel yields, which affects production targets.

The Source process has a priority weight of 0.200 with a performance score of 96.88, indicating that the quality and accuracy of Fresh Fruit Bunch (FFB) supply from suppliers have been maintained at a very high level. This reflects that raw material procurement activities particularly for FFB have been effectively implemented, starting from the registration of FFB transport vehicles at security checkpoints, verification of document completeness, to sorting at the loading ramp. This receiving process is considered sufficiently fast and accurate, thereby ensuring a smooth supply to the mill. Nevertheless, challenges remain in the form of inconsistent incoming FFB quality, such as the presence of unripe fruit, long stalks, and sand contamination, which may reduce CPO and kernel yields. The Make process subsequently obtained a performance score of 93.50 with a priority weight of 0.175. This is the lowest score among all processes, indicating that although still categorized as very good, production operations face several constraints related to reliability, processing time efficiency, and the mill's ability to adjust production capacity.

The Deliver process, although it does not represent the physical shipment of products, has a priority weight of 0.242 and a performance achievement of 97.54. This value demonstrates that the company maintains high accuracy and timeliness in issuing contractual documents, delivery orders (DO), and official reports (BA). Thus, even without direct shipment activities, the distribution administration system operates very effectively. Meanwhile, the Return process has the lowest priority weight of 0.090 but a high performance score of 98.00. This indicates that the mechanism for returning problematic raw materials such as substandard FFB has been handled quickly and effectively, without disrupting supply chain continuity.

When comparing priority weights with final performance scores, it is evident that processes with high priority weights, such as Deliver, achieved excellent performance, whereas Plan despite having the highest priority recorded a relatively lower score than other processes. This suggests that priority weights do not necessarily correspond directly to performance levels; rather, they indicate areas that are most critical for future improvement. Therefore, the company's strategic focus should be on enhancing planning and production effectiveness while maintaining high standards in procurement, distribution document management, and return mechanisms. Overall, this study confirms that the supply chain of PT Perkebunan Nusantara IV Regional V operates at a very high level of performance, supported by a near perfect final score and consistent effectiveness across all processes.

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