

Comparative Analysis of CPO Transportation in Sumatera Utara Province

Ade Rezkika Nasution¹, Diana Chalil², Satya Negara Lubis²

^{1,2}Master of Agribusiness on Faculty of Agriculture of University of Sumatera Utara

Corresponding Author: Ade Rezkika Nasution

ABSTRACT

Sumatera Utara province is the second largest palm oil producer in Indonesia. In the future, given the increasingly congested road traffic conditions and contain more risks, train is a solution in transporting large amounts of CPO, fast and efficient. Based on the Transport Infographic Indonesia - Indonesia Infrastructure Initiative 2015-2016 reported, users of goods transported by train are only about 1% of the total logistics distribution trips. About 90% is dominated by road transportation, less than 1% air transportation and 8% sea transportation. In the Master Plan Percepatan, Perluasan dan Pembangunan Ekonomi Indonesia (MP3EI) states that the Sumatera corridor needs important economic policies, one of them is the construction of a railway. The data used are annual time series data, namely in the form of production data, CPO transport volume in 2010-2018; length of rails and roads in 2018 and CPO transportation rates from PKS (palm oil mill) to Belawan Port. The objectives of this study were (1) to analyze the rate increasing of production and volume of CPO transportation by train in Sumatera Utara Province in 2010-2018; (2) to compare the comparison of rail lengths, national and provincial long roads to regional areas in Sumatera Utara Province in 2018; (3) to analyze the different of the cost of goods transportation by train and tank truck in the cost of CPO transportation for each PKS to the Port of Belawan and (4) to analyze the relationship between the cost of CPO transportation by train and tank truck with the distance of each PKS to the Port of Belawan. The data analysis method which is used in this study is descriptive analysis, the mean difference test and free from. The results of this study indicate that: the first, the growth of CPO production in Sumatera Utara in 2011-2018 increased, while the growth

of CPO transportation volume by train decreased. The second, the ratio of the length of the rail to the area is lower than the ratio of the length of the road to each regency area in 2018. The third, there is a significant difference between the average cost of CPO transportation by train and tank truck, and the cost of train is cheaper than tank truck Rp 142.48 per ton km. The fourth, there is a perfect and positive relationship between the cost of CPO transportation and the distance.

Keywords: comparison of transportation cost, CPO transportation, train, tank truck

BACKGROUND

Palm oil is one of the plantation commodities that have an important role in economic activity in Indonesia. Palm oil is also one of Indonesia's export commodities which are quite important as a source of foreign exchange in addition to oil and gas. The Master Plan for the Acceleration and Expansion of Indonesian Economic Development (MP3EI) 2011-2025 identifies that in Sumatera, the main economic activity of palm oil makes a large economic contribution, where 70% of palm oil producing land in Indonesia is in Sumatera. The MP3EI Master Plan states that to achieve the economic growth target of 6.3 percent by 2030, the Sumatera corridor needs important economic policy innovations such as the construction of ports, roads and railways, and the construction of energy generating centers (Danasaputra in Irawan, 2018).

One of the transportation options to support Palm Oil agribusiness in Sumatera

Utara Province is rail. Of a total of 11 Palm Oil producing Regencies with an area of more than 25,000 HA in 2018, there are 5 Regencies that are not supported by rail transportation. One of the Regencies with the largest area that is not traversed by the railroad in its territory is South Labuhanbatu Regency with a Palm Oil area of 154.68 thousand HA, production of 3.26 million tons of FFB and 730.55 tons of CPO in 2018. Meanwhile, the Padang Lawas Utara Regency, Padang Lawas and Mandailing Natal are palm oil producers with an area of less than 45 thousand hectares which are not traversed by railways. In Regencies that use train services to transport part of their CPO, the transportation costs are calculated based on the freight rates agreed between the Palm Oil Plantation Company and PT Kereta Api Indonesia (KAI). In the same regency, the cost of transportation by tank truck was also calculated based on the trucking rate.

According to Soesilo (1997) transportation has enormous benefits in overcoming the problems of a city or Regency. Some of the benefits that can be conveyed are:

1. Operating cost savings
2. Time saving
3. Reduction of accidents
4. Benefits resulting from economic development
5. The connection of an area with other areas through transportation routes

Based on the Transport Infographic Indonesia - Indonesia Infrastructure Initiative Report (2015-2016), users of railroad goods are only about 1% of total logistics distribution trips. About 90% is dominated by road transportation, less than 1% air transportation, and 8% sea transportation. Kuswati AS, et al (2011)

concluded in her research entitled The Role of Railway Infrastructure on the Regional Economy that from modeling analysis with variables of the number of traffic or service routes, the frequency of traffic and the number of train stations have significant effects on the growth of GRDP in areas where services are available. rail transport.

Judging from the growth rate of palm oil plantation production in each regency in Sumatera Utara Province compared to the growth of CPO transportation by land, the researcher then carried out an average differential test analysis to see the impact of rail freight transportation on palm oil agribusiness in Sumatera Utara Province.

Conceptual Framework

The production of palm oil plantations in each regency in Sumatera Utara Province is processed to the nearest Palm Oil Mill. Processed palm oil in the form of CPO is transported to Belawan Port by land. The transportation used in the transportation of CPO is trains and tank trucks for regencys that do not have a railroad in their area. In regencies that use train services to transport part of their CPO, the transportation costs are calculated based on the freight rates agreed between the Palm Oil Plantation Company and PT KAI. In the same regency, the cost of transportation by tank truck was also calculated based on the trucking rate. Furthermore, analysis of the average difference test was carried out to see the impact of rail freight transportation on palm oil agribusiness in Sumatera Utara Province. A correlation test was also carried out between the mileage and the cost of each transportation. The following framework can be summarized in the following schematic diagram.

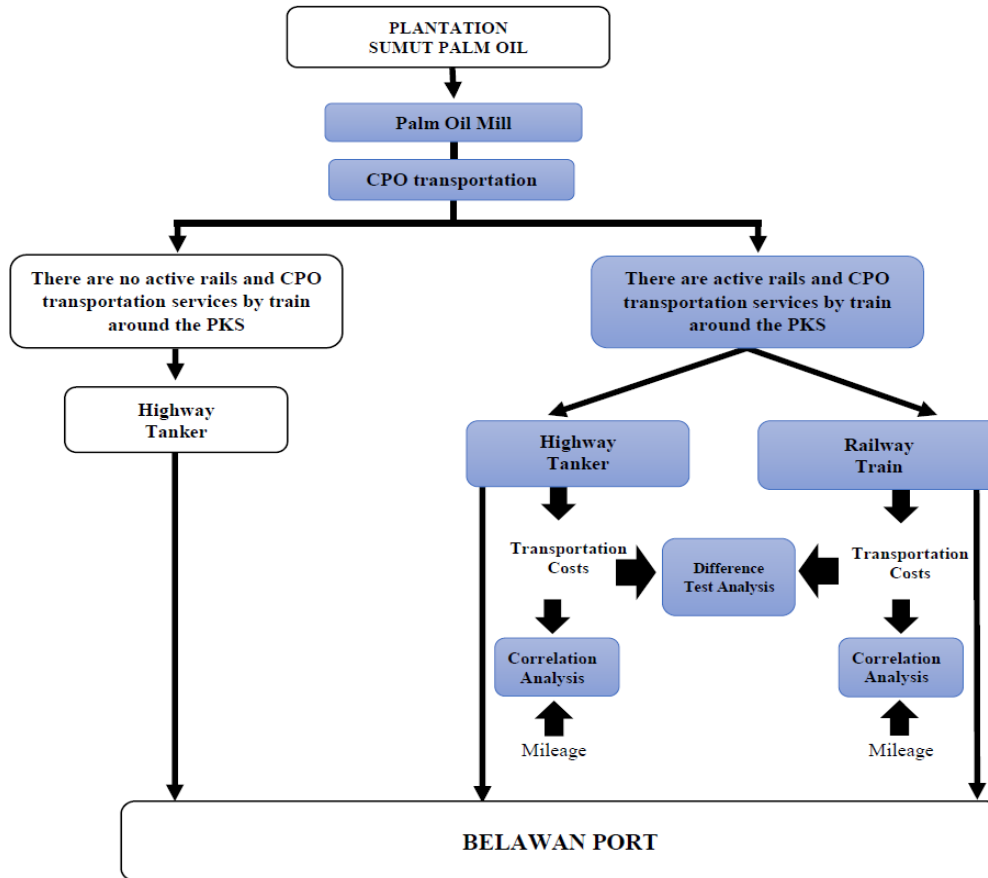


Figure 1. Research Thinking Framework

HYPOTHESIS

- 1) The growth rate of production and volume of CPO transportation by train in Sumatera Utara Province in 2010-2018 increased.
- 2) The ratio of rail length to area is smaller than the ratio of road length to area in Sumatera Utara Province in 2018.
- 3) There is a significant difference between the cost of transporting CPO by train and tank truck in Sumatera Utara Province.
- 4) There is a real relationship between the cost of transporting CPO by train and tank truck with the distance travelled by each PKS to Belawan Port.

RESEARCH METHODS

Determination of the sample in this study was carried out purposively with the

criteria of palm oil producing Regency / cities whose areas are traversed by railways and roads, namely Asahan, Labuhanbatu, Labuhanbatu Utara, Simalungun and Serdang Bedagai Regency. The data used is data from 2010-2018, which is related to the distance of each train station that serves CPO transportation to the Port of Belawan, the volume of CPO transportation by train per year, the area of palm oil production in each regency per year, the CPO transportation rates from each train station that serves CPO transportation to the Port of Belawan, list and capacity of palm Oil Mill in each palm oil producing regency, CPO transportation rates by tank trucks from each palm producing regency. The data analysis used was descriptive analysis, analysis of the average difference test and correlation analysis.

Table 1. Data analysis method

No.	Research purposes	Data Required	Data analysis method
1.	Knowing the rate of increase in production and volume of CPO transportation by train	<ul style="list-style-type: none"> Annual time series data of production and transportation volume of CPO by train in Sumatera Utara Province in 2010-2018 	Descriptive Analysis
2.	Knowing the proportion of railroad lengths and lengths of national and provincial roads to the area of each Regency / City in 2018	<ul style="list-style-type: none"> Data on the area of regencys / cities in Sumatera Utara Province and maps of railroads in 1997 and 2018 	Descriptive Analysis
3.	Analyzing the difference in the cost of CPO transportation with trains and tank trucks in Sumatera Utara Province	<ul style="list-style-type: none"> Data on transportation costs by tanker and train to the Port of Belawan 	Analysis of Average Difference Test
4.	Analyze the relationship between the cost of transporting CPO by train and tank truck with the distance from each PKS to the Port of Belawan	<ul style="list-style-type: none"> Data on the cost of transportation by tanker and train and the distance to the Port of Belawan 	Correlation Analysis

The data obtained in the research results are quantitative data. The first and second problems were analyzed descriptively by tabulating the data, then explaining the rate of increase in land area, production, and volume of CPO transportation by train; and the proportion of railroad lengths and lengths of national and provincial roads to the total area of each Regency / City in 2018. To determine the impact of rail freight transportation on palm oil agribusiness in Sumatera Utara Province, the transportation costs by train and truck were calculated tank and see the relationship between the cost of transport and the distance traveled.

RESULTS AND DISCUSSION

The Rate of Increase in Land Area, Production and Volume of CPO Transportation by Train in Regencies / Cities of Sumatera Utara Province in 2010-2018

In the last 8 years, 11 regencies in Sumatera Utara with land areas of more than 25 thousand hectares have increased and decreased both in terms of area and production. There are 2 regencies that have decreased their area, namely Labuhan Batu by 8.54% and Padang Lawas Utara by 16.09%. However, only Labuhan Batu experienced a 25.26% decline in CPO production.

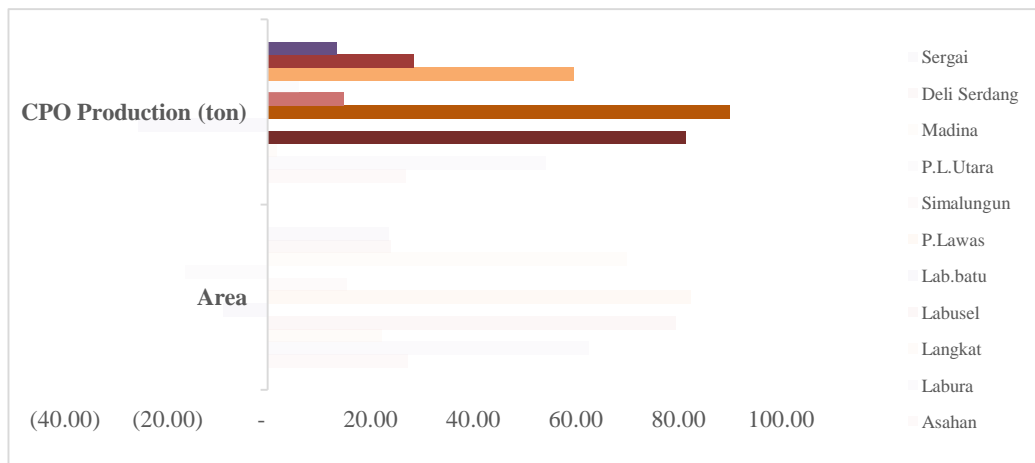


Figure 2. Growth Rate of Palm oil Area (ha) and Production of CPO (tons) in 11 regencies in Sumatera Utara Province (2011-2018)

Volume of CPO Transportation by Train in Regencies / Cities of Sumatera Utara Province in 2010-2018

In 2010-2018, trains carried 3,683,376 tons of CPO originating from 13 Palm Oil Mill (PKS) units in Sumatera Utara Province. PKS, which processes Fresh

Fruits Bunches (FFB) into CPO is a factory owned by 4 large state companies and private palm oil plantations, namely PTPN III, PTPN IV, PT SMART and PT MUSIM MAS with locations spread across 6 regencies in Sumatera Utara Province.

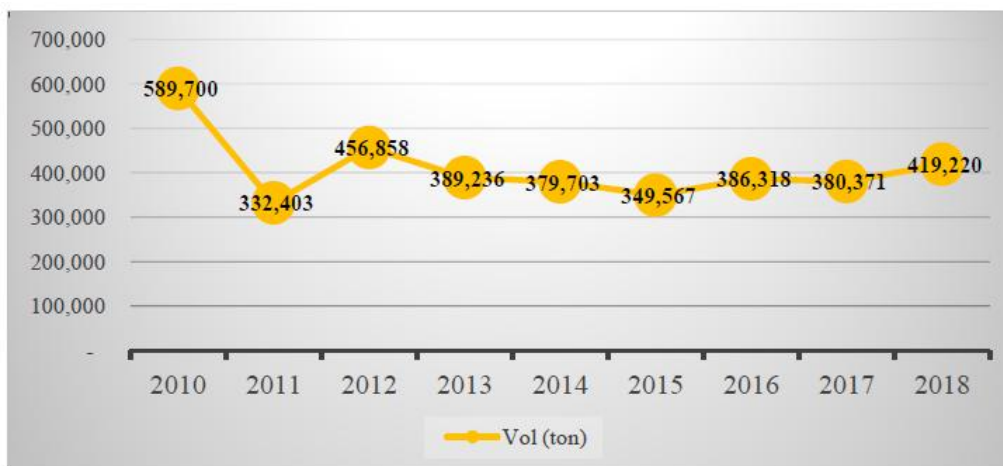


Figure 3. Growth of CPO Transportation Volume by Train in Sumatera Utara Province 2010-2018 (tons)

The growth in the volume of CPO transportation by train has fluctuated with a downward trend, as seen in Figure 3. The downward trend can be seen from the average rate of growth in the volume of transport which is negative (8)%. The growth in transportation volume at its highest point occurred in 2012, amounting to 27%, amounting to 456,858 tons with the highest growth coming from PT MUSIM MAS, which increased by 55,714 tons. Meanwhile, the growth of transportation volume at its lowest point occurred in 2011, namely (77)%, which was 332,403 tons, with the lowest growth coming from PT MUSIM MAS, which was reduced by 100,108 tons.

PTPN IV is the producer with the highest volume transported by train, namely 1,499,256 tons with an average of 166,584 tons per year. The average volume growth rate for transported CPO is (1)%. PTPN III with the second highest volume of 725,999 tons with an average of 80,667 tons per year. The average volume growth rate of CPO transported is (24)%. PTPN IV with the third highest volume of 539,463 tons with an average of 59,940 tons per year. The average volume growth rate of CPO transported is (27)%. The CPO produced by PTPN IV mill is transported to Belawan via Rantau Prapat, Puloraja, Henglo, Tebing Tinggi and Dolok Merangir Stations. PT MUSIM MAS with the fourth highest volume of 468,205 tons with an average of

52,023 tons per year. The average volume growth rate of CPO transported is (78)%. The CPO produced by PT MUSIM MAS is transported to Belawan via Rantau Prapat Station. PT SMART with the lowest volume of 450,453 tons with an average of 50,050 tons per year. The average volume growth rate of CPO transported is (36)%. The CPO produced by PT SMART is transported to Belawan via Padang Halaban Station.

Comparison of Rail Length, National and Provincial Road Length to the Area of Each Regency Producing Palm Oil in 2018

In 2018, Deli Serdang Regency with an area of 2241.68 Km² is an area supported by road and rail transportation facilities, namely roads along 3932.41 Km with a proportion of 175.42% of its area and railroads along 90 Km 'sp. with the proportion of 4.01 of its total area. However, PT KAI does not provide frequency for CPO transportation services in this area because Deli Serdang Regency is a small CPO producer, which is related to CPO production in 2018 which was only 108,255 tonnes.

In contrast to Langkat Regency which is the third largest CPO producer with a production of 527,120 tons, PT KAI also does not provide a frequency for CPO transportation services in this area because the 77 Km'sp railroad is in the process of developing it. With an area of 6262 Km²,

Langkat Regency with road facilities along 1813.77 Km with a proportion of 28.96% of its area only uses tank truck transportation services in its distribution to Belawan Port.

Meanwhile, Padang Lawas, Padang Lawas Utara and Mandailing Natal Regencies have high CPO production, but they are not supported by railroad facilities. With the proportion of road length in each regency, namely 32.51%; 36.56% and 37.61% of their total area, these three regions only use tank truck transportation services in distributing CPO to Belawan Port.

Asahan, which is the largest producer in 2018 with a production of 768,361 tons of CPO, has adequate road and rail transportation facilities. The road is 1729.38 km long, which is 46.71% of the total area and railways along the 78 km², which is 2.11% of the total area. With the frequency of transporting CPO once a day from Kisaran Station to Belawan Station and 2 times from Pulo Raja Station and Sei Bejangkar Towards Kisaran, Asahan has become the regency with the third largest volume of CPO transported by train in 2011-2018.

Labuhan Batu is a large CPO producer with a long railroad proportion of 0.88% of its area of 457,286 Km². Meanwhile, South Labuhan Batu is still in the process of constructing a railroad track, so CPO from Labuhan Batu Selatan is transported through the Rantau Prapat station in Labuhan Batu.

Simalungun with an area of 4369 km² has roads with a percentage of 49.91% and railroads with a percentage of 0.61% of the total area. PT KAI provides CPO transportation services at Dolok Merangir Station and Perlanaan Station each 1 times the frequency per day.

Labuhan Batu Utara with an area of 3570.98 Km² has roads with a percentage of 31.16% and railroads with a percentage of 1.2% of the total area. PT KAI provides CPO transportation services at Rantau

Prapat Station 2 times the frequency per day and at Padang Halaban Station one time per day.

The existing road facilities in Sumatera Utara Province are adequate for each palm oil producing regency so that it supports palm oil companies in developing palm oil agribusiness. Not only are roads adequate, but road quality also affects transport efficiency, according to the results of research by Syumanjaya and Tarigan (2013) which suggest that the quality of road infrastructure has a negative effect on the cost of marketing transportation for agricultural products in Dolok Silau Regency. The better the quality of infrastructure, the less transportation costs will be borne by farmers.

Langkat Regency which only uses tank truck services in the distribution of CPO has provincial roads with good quality of 52.67%. Meanwhile, Padang Lawas, North Padang Lawas and Mandailing Natal Regencys which also only use tank truck services in the distribution of CPO have provincial roads with good quality, namely 34.92% respectively; 36.62%; 33%. Meanwhile, the quality of heavy damage is below 22%. The existence of CPO transportation services by train also plays a role in the development of palm oil agribusiness in Sumatera Utara Province. Not only railroad facilities, the active use of railroads used in transportation services with frequencies that have been regulated by the Ministry of Transportation and PT KAI is also important in increasing transportation efficiency. This is based on the Regulation of the Minister of Transportation Number 60 of 2012 concerning the Technical Requirements for Railway Lines as a reference that it is necessary to increase cross capacity by increasing the speed and tonnage of trains through increasing rails and concrete bearings. The percentage comparison of active and inactive railroad tracks in Sumatera Utara is in Table 2 below.

Table 2. Comparison of Active and Inactive Rails to Total Rail in Sumatera Utara Province (2018)

No	Regency	Railways	Active Railways	% on total railways	Non-Active Railways	% on total railways
1	Asahan	78	73	93.59	5	6.41
2	Labura	43	43	100	-	-
3	Langkat	77	-	-	77	100
4	Labusel	KDP*	KDP*	-	KDP*	-
5	Labuhanbatu	19	19	100	-	-
6	Simalungun	26.5	26.5	100	-	-
7	Deli Serdang	90	42	46.67	48	53.33
8	Sergai	69.5	69.5	100	-	-

Freight Transportation Costs by Train and Tank Truck in the Transportation of CPO in Each Regency / City to the Port of Belawan

The calculation of the cost of transportation for CPO transportation per month is calculated based on the capacity of each PKS with an operational 10 hours a day. As a basis, 10 tons of FFB produce 2.18 tons of oil and a specific gravity of 0.85. Furthermore, each tanker can carry a maximum of 30 tons of CPO per truck, while the train series can carry a maximum of 18 tanks with a weight of 35 tons per tank. CPO transportation rates by train are obtained from negotiated prices with each oil palm plantation company with central PT KAI, with different prices at the origin of the PKS with 10% VAT. Meanwhile, the calculation of CPO transportation rates by tanker trucks is obtained based on an example of calculations from one of the transportation partners companies with PT KAI which conducted Delivery Order services to several oil palm companies.

Table 3. Comparison of Average CPO Transportation Costs by Train and Tank Truck

Types of CPO Transportation	Mileage (Km)	Average Cost (IDR / ton)	Average Cost (IDR / month)
Tanker	197.42	75.501	194.984.105
Train	189	49.687	143.415.998
Difference	8.42	25.814	51.568.107

The difference between the average cost of CPO transportation with tank trucks and trains is IDR 15,814 per ton and IDR 51,568,107 per month, with the calculation of CPO transportation costs as much as 32,250 tons per month.

Based on the test results of the average difference in the cost of CPO transportation per ton-km by train and tank truck with the Paired Sample T-test method,

the t-count is 5.686 with a significance value of $0.000 < \alpha = 0.05$, which indicates that there is a significant difference between the average cost of CPO transportation per ton-km by train and tank truck. The average CPO transportation costs by train and tanker can be seen in the Paired Sample Statistics table (Appendix 9) which shows that the average CPO transportation cost by train is IDR 233.76 per ton km which is cheaper by IDR 142.48- per ton-km when compared to the CPO transportation cost for tank trucks of Rp. 376.24 per ton-km.

The result which states that there is a real difference from the average cost of CPO transportation by train is in accordance with the research of Nazlina and Surbakti, MS (2012) which concluded that the price of transportation per ton of transportation by train is cheaper than using trucks. However, other results also suggest that the disadvantage of rail transportation is inflexibility, where the frequency of its use is highly dependent on the train departure schedule made by PT KAI (GAPEKA chart). So that at certain times, if a large amount of transportation is needed, the train transportation cannot fulfill it on the same day.

The distance travelled by train is also closer than that of a tank truck, with a difference in the average mileage of 8.42 km. In addition, PT KAI's contracts with palm oil companies also have requirements, namely that there is a minimum quantity of CPO transported in a year, so that the oil palm companies that use rail services are big companies. Meanwhile, small companies that cannot reach the minimum quantity requirement are required to use the services of a tank truck that can perform contracts per several days per ton. If you

still want to use CPO transportation services by train, small companies that cannot reach the minimum quantity requirement are forced to pay higher rates.

Relationship of CPO Transportation Costs by Train and Tank Truck with Mileage from Each Palm Oil Mill to Belawan Port

Table 4. Results of Correlation Test between CPO Transportation Costs and Mileage on Each Type of Transportation

Types of CPO Transportation	Mileage (Km)	Average Cost (IDR / ton)	Sig	Pearson Correlation
Tanker	197,42	75.501	0,000	0,964
Train	189	49.687	0,000	0,920

Based on the results of the correlation test of CPO transportation costs per ton with the distance using trains and tank trucks, it is obtained a significance value of $0.000 < \alpha = 0.05$, which indicates that there is a significant relationship between CPO transportation costs per tonne with the distance, both using trains and tank trucks. The Pearson Correlation values are both 0.964 and 0.920, which indicates that the relationship between CPO transportation costs and mileage, both train and tanker transportation, is a perfect relationship.

CONCLUSION

1. The growth in CPO production in Sumatera Utara Province in 2011-2018 has an increasing trend, while the growth in the volume of CPO transportation by train in Sumatera Utara Province in 2011-2018 has a declining trend.
2. The ratio of the length of the rail to the area is lower than the ratio of the length of the road to the area of each Regency in 2018.
3. There is a significant difference between the average cost of transporting CPO by train and tank truck, with rail transport costs cheaper by Rp. 142.48 per ton-km than by tanker.

4. There is a perfect and positive relationship between CPO transportation costs and the distance travelled.

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