



ANALYSIS OF FISH DELIVERY IN PANDEGLANG BANTEN: A CASE STUDY OF LABUAN FISH AUCTIONS

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ABSTRACT

Fishery commodities are one of the categories of goods that are easily damaged so that quality is maintained as a key factor in shipping goods. This research analyze on the scheme of determining the mode of transportation using Break Even Point (BEP) and analyzing the optimization of the route by minimizing the distance traveled by using the Traveling Salesman Problem (TSP) method. The results of this research is optimizing the mode of transportation using private modes with the number of trips under 576 trips and the optimal route of travel that is Pandeglang-Jakarta-Bogor-Pelabuhan Ratu-Pandeglang of 408 Km.

Keywords: Fish, Delivery , BEP, TSP

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1. INTRODUCTION

Transportation is an important thing in the distribution of goods. Goods that have a perishable category are very important to pay attention to in terms of stock availability and special handling during the distribution process so that the goods received by customers are in accordance with the expected conditions (Santosa, Hidayat and Siskandar, 2021). Fishery commodities are one of the categories of goods that are easily damaged so that quality is maintained as a key factor in shipping goods. Therefore, proper shipping management is needed.

The key factor in the delivery of perishable goods is to pay attention to the mode of transportation that has the highest proportion of costs in a supply chain management (Liecharlie, 2018). In the fish supply chain, limited transportation capacity is an obstacle to sending all goods at the same time because of the characteristics of the fish. This distribution makes fish companies serve consumer demand based on priorities (Abedi and Zhu, 2017). The development of transportation technology related to fish resilience during shipping is very concerned (Kusuma, Rahem and Maimunah, 2018; Zhang *et al.*, 2019). The combination of modes of transportation and the routes traversed can make the distribution of perishable goods more optimal (Hidayat, Santosa and Siskandar, 2021; Nurdin *et al.*, 2021).

This research focuses on the scheme of determining the mode of transportation which refers to the private mode ownership of the fish company by leasing the mode of transportation through a third party using Break Even Point (BEP) analysis on the unit that is implemented on the number of transportation modes. In addition, analyzing the optimization of the route by minimizing the distance traveled by using the Traveling Salesman Problem (TSP) method.

2. RESEARCH METHOD

Break Even Point Analysis (BEP) is a tool to analyze the effect of fixed costs, variable costs, and returns that are used for planning, controlling, and decision making in an industry (Alnasser, Shaban and Zubi, 2014; Kampf,

Majerčák and Švagr, 2016). Determined when the costs of two alternatives are influenced by variables so that a value can arise from uncertain factors where the alternatives incur the same costs (Sunaryo and Sufrianto, 2020). Break Even Point (BEP) analysis uses seven methods in the form of a trial and error approach, a graphic approach, and mathematics (Jamaludin, 2019). The calculation formula for this BEP approach is as follows:

$$TC1 = TC2; f1[x] = f2[x] \quad (1)$$

Where:

TC1 & TC 2 : the total amount assigned per time period, per project or per unit is used for each alternative 1 and alternative 2..

X : factors that affect alternative 1 and alternative 2.

The Traveling Salesman Problem (TSP) is the length of the trip that is assumed to be a node and the node is divided into clusters (Baniasadi *et al.*, 2020). The formulation used for the Traveling Salesman Problem (TSP) method is as follows (Ardiansyah, Darajatun and Rinaldi, 2021):

1. The decision variable used is the distance traveled which is denoted by X_{ab} .
2. The objective function to minimize and constraint with the formula:

Objective function:

$$Z = \sum_{a=1}^n \sum_{b=1}^n C_{ab} X_{ab} \quad (2)$$

Constraints:

$$\sum_{a=1}^n X_{ab} = 1 \quad (i = 1, 2, 3, \dots, n) \quad (3)$$

$$\sum_{b=1}^n X_{ab} = 1 \quad (i = 1, 2, 3, \dots, n) \quad (4)$$

$$\sum_{b=1}^n X_{ab} = 0 \text{ atau } 1 \quad (5)$$

This constraint limit where the route traversed is a city that is only passed once. The calculation of the Traveling Salesman Problem (TSP) method uses a tool, namely Microsoft Excel Solver 2016.

3. FINDING AND DISCUSSION

There are 14 fish auction places in Pandeglang Regency. In this study a case study was used at the Labuan Fish Auction Place (TPI). In the

delivery of fish carried out by TPI is by renting transportation through a third party. The calculation of determining transportation modes using Break Even Point analysis for types of transportation modes at TPI Labuan is as follows:

a. Private Mode

The analysis of the type of truck is adjusted to the current existing conditions, namely renting the type of Colt Diesel FE 71 Super HD (4X2) M/T. The details of the cost calculation for the purchase of these types of vehicles are as follows:

- Fixed Cost : Rp. 401.000.000

- Variable Cost per Trip : Rp.804.000

- Fuel Cost : Rp 450.000

- Toll Cost : Rp.150.000

- Maintenance cost : Rp. 37.000

Maintenance schedule per year : 4 times

Oil change : Rp.748.000

Cleaning solar tank : Rp.350.000

Total cost per year : Rp. 13.176.000

Total cost per day : Rp.37.000

- Driver and attendant costs

Salary per month: Rp. 5.000.000

Salary per Day : Rp. 167.000

b. Rent Mode

Rental mode of transportation for the type of Colt Diesel Engkel truck with a maximum capacity of 2 Tons is Rp. 1,500,000/trip. Break Event Point calculations to see the efficiency of the number of trips used are as follows:

$$TC1 = TC2$$

$$Rp\ 401.000.000 + Rp\ 804.000x = 0 + Rp\ 1.500.000x$$

$$Rp\ 1.500.000x - Rp\ 804.000x = Rp\ 401.000.000$$

$$x = Rp\ 401.000.000 / Rp\ 696.000$$

$$= 576\ trips$$

From the results of this calculation, a Break Event Point (BEP) analysis can be carried out on

the number of trips which show 576 trips. This can provide optimization of the mode of transportation used. The choice of mode with a rental scheme will be more efficient. If the delivery is less than 576 trips and vice versa if the distribution is more than 576 trips, it is better if the transportation mode purchase scheme itself is selected and managed by TPI Labuan.

This has an impact on long-term management, which is easy to overcome if there are delivery problems. Recently, that occurs for one year is 360 trips. Therefore, TPI Labuan's strategy is appropriate to implement the rental of transportation modes through third parties in the delivery of fish to consumers.

Distribution activities carried out to serve consumers outside the Pandeglang area. These consumers are located in the areas of Jakarta, Bogor, and Pelabuhan Ratu. The region is given a node symbol which can be seen in Table 1.

Table 1. Node Symbols

No	City	Notice	Node
1	Pandeglang	Origin	0
2	Bogor	Destination	1
3	Jakarta	Destination	2
4	Pelabuhan Ratu	Destination	3

After being given a symbol for each node, the next step is to identify the existing route that is passed for shipping fish from Pandeglang. The route that occurs starts from Pandeglang to the city of Bogor. After that, from the city of Bogor, the vehicle goes to the city of Jakarta. The last shipment from Jakarta to Pelabuhan Ratu and then back again to Pandeglang with a total travel distance of 478 km. The existing routes that occur can be seen in Table 2.

Table 2. Distance Trip

Origin (p)	Destination (q)	Distance (Dpq)
0	1	104
1	2	54
2	3	147
3	0	173
Total Distance		478

Processing data to determine the optimal route using Microsoft Excel Solver 2016. The existing route data is processed and simulated for

objective function, and constraints using these tools with the following processed results:

Table 3. Objective Function Process

Cell	Name	Original Value	Final Value
\$E\$14	Total Distance Distance (Dpq)	478	408

Table 4. Constraint Process

Cell	Name	Cell Value	Formula	Status	Slack
\$D\$10	Destination (q)	2	\$D\$10<=3	Not Binding	1
\$D\$11	Destination (q)	1	\$D\$11<=3	Not Binding	2
\$D\$12	Destination (q)	3	\$D\$12<=3	Binding	0
\$D\$10	Destination (q)	2	\$D\$10>=1	Not Binding	1
\$D\$11	Destination (q)	1	\$D\$11>=1	Binding	0
\$D\$12	Destination (q)	3	\$D\$12>=1	Not Binding	2
\$D\$10:\$D\$12=AllDiff					
\$D\$10:\$D\$12=Integer					

Table 5. Results

Origin (p)	Destination (q)	Distance (Dpq)
0	2	100
2	1	54
1	3	81
3	0	173
Total Distance		408

From the results of processing using Microsoft Excel Solver 2016 the results obtained that the optimal route distance that can be traversed is 408 km. This results in a distance efficiency of 70 km. The optimal route to be followed starts from Pandeglang to Jakarta, then the vehicle departs back to Bogor, then departs back to Pelabuhan Ratu, and returns to Pandeglang. The route traversed can be seen in Figure 1.

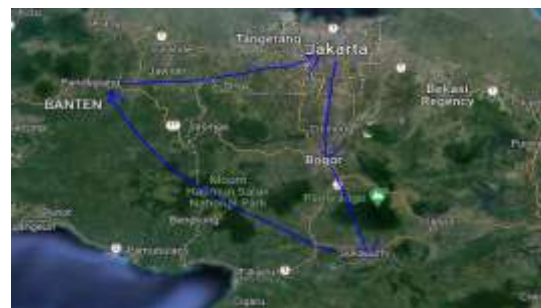


Figure 1. Optimal Route

4. CONCLUSION AND SUGGESTION

Analysis of fish shipments at TPI Labuan by focusing on the mode of transportation and the route taken, it is found that optimization occurs in the mode of transportation, namely the transportation mode rental scheme with a third party is more efficient because the number of trips that occur only reaches 365 trips less than the break-even point that occurs, which is 576 trips. In addition, optimizing the distance of the

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travel route taken is the mode of transportation from the point of origin, namely Pandeglang-Jakarta-Bogor-Pelabuhan Ratu-Pandeglang of 408 Km.

Future research is expected to be able to analyze the planning for the number of fish requests that will be served by the fish auction, so that this research can be carried out related to the number of needs for ideal transportation modes and planning optimal routes in shipping to consumers.

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