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Determination of Chicken Egg Distribution Channels in Bumdes Makmur Rejo Using the Saving Matrix Method

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Abstract

Distribution is very important in a company, because distribution is an activity of moving goods or services from suppliers to customers. Any goods or services can be transported from one company location to a consumer location. The distance between locations can also affect the delivery process. Delivery of goods is a basic need every day that can carry out the delivery process quickly and safely so that the goods are delivered on time so that the company can get more profits. This BUMDesa has problems with the distribution of egg shipments where the distribution is still not effective and efficient. This study uses the saving matrix method to determine the most efficient and effective distance so as to save time and fuel costs. The results of this study, the initial route of 65.08 Km costs Rp. 442,544 and the required fuel is 6,508 Lt. Meanwhile, the new route 56.4 will cost Rp. 383,520 and the required fuel is 5.64 Lt.

Keywords: distribution, saving matrix, distance.

INTRODUCTION

Distribution is very important in companies, because distribution is an activity of moving goods or services from suppliers to customers (Natalin et al., 2021). Any goods or services can be transported from one company location to a consumer location. The distance between locations can also affect the delivery process. Delivery of goods is a basic need every day that can carry out the delivery process quickly and safely so that goods are sent on time so that companies can get more profits (Nawawi, 2022). One important factor that affects a company's ability to sell its products to consumers is distribution problems (Hanim et al., 2022). Distribution can be seen clearly as a process that facilitates the movement of goods and services from producers to consumers (Muhammad et al., 2017).

Facilities are good facilities that can be in the form of goods or services that have been provided by the company to customers in order to achieve customer satisfaction (Maulani1 et al., 2018). Customer satisfaction will be fulfilled if they get what they want, the higher the level of customer loyalty to the company (Gultom et al., 2020). Customer loyalty is a customer's commitment to stay in depth to subscribe consistently in the future, even though situational influences and marketing efforts have the potential to cause behavior changes (Putra, 2021). Marketing is one of the most important factors to show companies, especially companies engaged in goods and services (Hidayat & Rahmat, 2018). With the procurement of goods and services starting with the purchase or sale of goods transactions directly on the market using cash (Afifah & Setyantoro, 2021). Direct sales are carried out by sellers or companies in order to get regular customers every day.

This BUMDesa company is engaged in chicken egg breeders. Currently BUMDesa is having problems. The problem is in the process of distribution and transportation costs for delivery of chicken eggs. Delivery that is not yet effective and efficient can affect the cost of

sending eggs to SMEs.

Deliveries are made 5 times a week without merging travel routes from depot to depot that have become customers. This shipping problem can be solved by using the saving matrix method. The saving matrix method can be used to build low-cost shipping routes so that products reach customers (Sugiono, C. M., 2022). Sometimes goods are distributed without first checking the distribution route, so there will be a bit of waste when distributing goods (Trisna et al., 2019).

METHOD

Saving matrix in research (Istantiningrum, 2010) This method is used to determine the distance, route, time or cost of product delivery from the producer to the consumer. This approach is taken to ensure effective and efficient delivery of goods according to customer orders, thus saving costs, labor and company delivery time. The steps for using the saving matrix method are as follows:

1. Determine the distance matrix

The distance determination starts from the distance between one place and another. This distance determination is visualized from the Google Maps application to help find the distance between one place and another.

2. Calculation of the distance matrix

Calculation of the distance matrix assumes that the location will be passed directly by vehicles. Calculate this distance matrix by looking at rows times columns, to get the given distance.

3. Analyze the matrix using the saving matrix method

Will analyze the existing distance matrix for each route in order to calculate the selected route. This distance matrix calculation will produce a matrix with a new path from the calculated distance.

After obtaining the distance matrix using the saving matrix method, the transportation load for each recommended route is calculated. First, determine the payload capacity of each carrier to allocate each shipment. Second, create a route with savings and find the highest value in the distance matrix from the saving matrix method as the first route. After obtaining the maximum value in the distance matrix of the backup saving matrix method, calculate the capacity sent to the office so that the route does not exceed the capacity of car transportation.

If the branch cannot meet the carrying capacity, the next highest value will be re-elected to be included in the first route until the carrying capacity is met or not exceeded. If you are satisfied, get the first route. Third, redefining the second route and subsequent routes from the same road, namely looking for the highest value in the distance matrix of the saving matrix method until the carrying capacity of the vehicle is reached or not exceeded. The calculation is complete and the existing branches are included in the route.

$$S\ (x, y) = J\ (G, y) + J\ (x, y) - J\ (x, y)$$

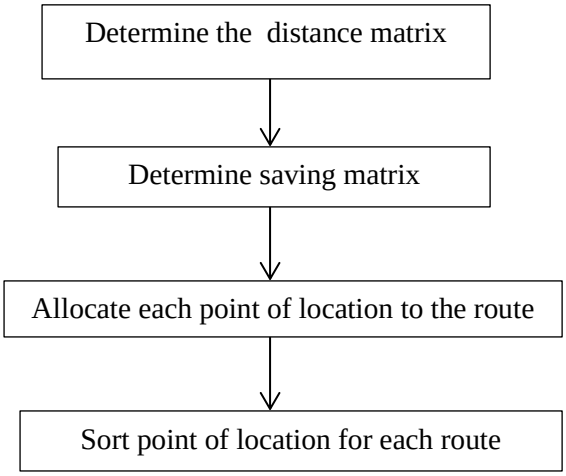

Figure 1. Flowchart of the Saving Matrix Method

RESULT AND DISCUSSION

Table 1. ***Saving Matrix***

	Depot	A	B	C	D	E	F	G	H	I	J
A	9	0									
B	9,3	18,09	0								
C	10,1	17,9	18,55	0							
D	0,29	2,39	2,49	2,49	0						
E	0,55	2,45	2,55	2,55	0,62	0					
F	0,35	2,45	2,45	-0,05	0,59	0,7	0				
G	0,3	2,4	2,5	2,4	0,49	0,6	0,6	0			
H	0,6	2,3	2,3	2,3	-0,01	0,05	-0,05	-0,05	0		
I	0,85	2,25	2,35	2,35	0,04	0	0	-0,05	1,22	0	
J	1,2	2,4	2,4	2,4	-0,01	0,05	-0,05	0	1,2	1,82	0

The initial route that has been carried out by BUMDesa Makmur Rejo using the egg delivery request calculation method every day is from the depot to the store and back again to the depot. The total initial route distance was 65.08 km. However, in this thesis, a total distance was proposed based on the Saving Matrix method which resulted in a total distance of 56.4 km.

Thus, the distance that can be saved can be calculated by subtracting the total distance of the initial route (65.08 km) from the total distance of the proposed route (56.4 km). The result is 8.68 km, which is equivalent to 13.35% of the original route's total distance. Thus, based on these calculations, there is a potential distance saving of 8.68 km or around 13.35% of the original route. At first, BUMDesa Makmur Rejo paid a transportation fee of Rp. 47,000 per day for egg delivery. Based on company data, delivery takes 5 working days a week, so the total cost for one delivery 2 times that has not been joined in one route is Rp. 235,000. Thus, the total transportation costs required for one delivery route back to the depot is Rp. 470,000.

Currently, the price of diesel fuel is generally able to reach a distance of 10 km per liter. By using the initial route which has a total distance of 65.08 km, the actual fuel needed is 6.508 liters. Assuming the fuel price per liter is Rp. 6,800, then the total cost required is Rp. 442,544.

However, if you use the proposed route with a total distance of 56.4 km, the amount of fuel needed is 5.64 liters. Assuming the fuel price per liter is Rp. 6,800, the total cost required is only Rp. 383,520. Thus, there is a cost savings of Rp. 59,024 by using the proposed route. Delivery with the proposed route only takes 1 day with delivery of 2 routes one way and considering the transport capacity.

Table 2. Fuel Cost Comparison

	Mileage (KM)	**Fuel needs (Lt)**	**Fuel costs**
Before *saving matrix*	65,08 KM	6,508 Lt	Rp. 442.544
After *saving matrix*	56,4 KM	5,64 Lt	Rp. 383.520

Even if calculated individually, the cost savings using the proposed routes are small. However, if applied regularly in every delivery, the value of these savings will be large and significant. Besides that, the delivery time will also be more efficient because the proposed route takes into account the transport capacity. Nearest Insert determines the distance from the closest to the depot which results in 54.19 Km while the Farthest Insert determines the distance from the furthest from the depot with a result of 163.32 Km

Table 3. Comparison of Nearest Insert and Farthest Insert

Route	***Nearest Insert***	***Farthest Insert***
1	37,95 km	37,95 km
2	9,6 km	11,9 km
3	3,87 km	3,87 km
4	1,1 km	1,6 km
5	1,67 km	108 km

CONCLUSION

On this issue, you can see the savings in shipping costs for each different route. The initial route of 65.08 Km costs Rp. 442,544 and the required fuel is 6,508 Lt. Meanwhile, the new route 56.4 will cost Rp. 383,520 and the required fuel is 5.64 Lt. Determination of the shortest route can be known by means of the new route minus the old route, the new route is 56.4 km – the old route is 65.08 km = -8.68 km. These results state that the distance savings or the difference between the old and new distances is -8.68 km. Nearest Insert determines the distance from the closest to the depot which results in 54.19 Km while the Farthest Insert determines the distance from the furthest from the depot with a result of 163.32 Km

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